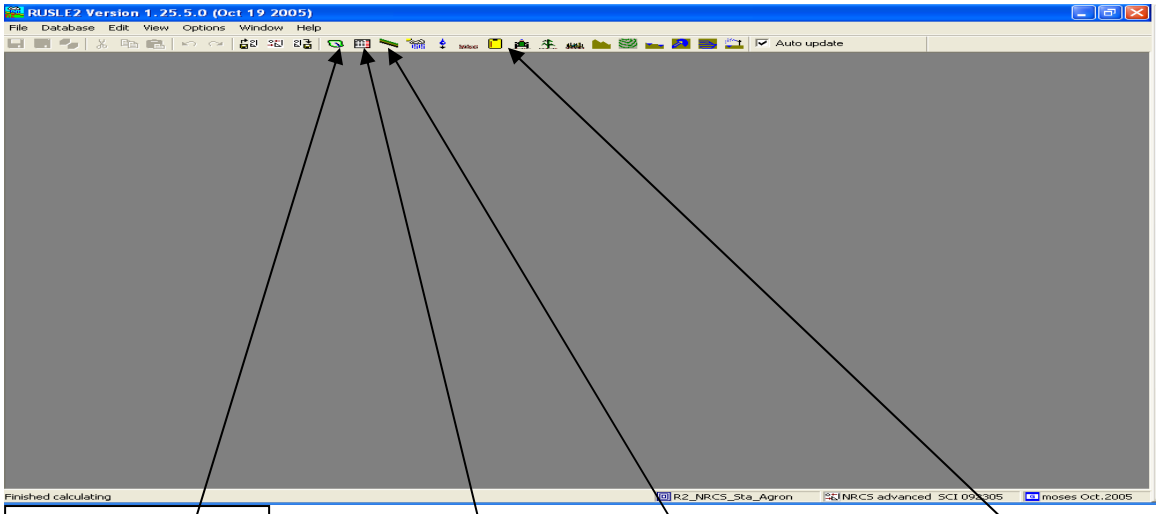
RUSLE2 User Guide
December 2005

Open the Program. Your program will open either with a blank gray screen, or with the profile view open. The buttons just above the screen allow you to open different screens (views) within RUSLE2.



Plan View (Green Watershed Icon)

Worksheet View (Data Sheet)

Profile View (Green Sloping Line

Managements (Yellow Clipboard)

These views are like building blocks in the program. The basic building block is called managements.

Managements are crops and tillage operations put together into crop rotations (with the crops and associated tillage for each management.). These managements are used in the profile view to get soil loss and associated answers for one field or landscape. See the instructions for Building a new rotation in Rusle2 for instructions on the use of the management screen. There is a set of managements for each Crop Management Zone (CMZ) in the country. We have three CMZs in Minnesota: 1,2, and 4.

Profiles are the second building block in the program. A profile is the screen where you enter information about one specific field or landscape that you want to model. To open the profile screen, click on the green sloping line. Your computer may be set to automatically open up to this screen when you open Rusle2.

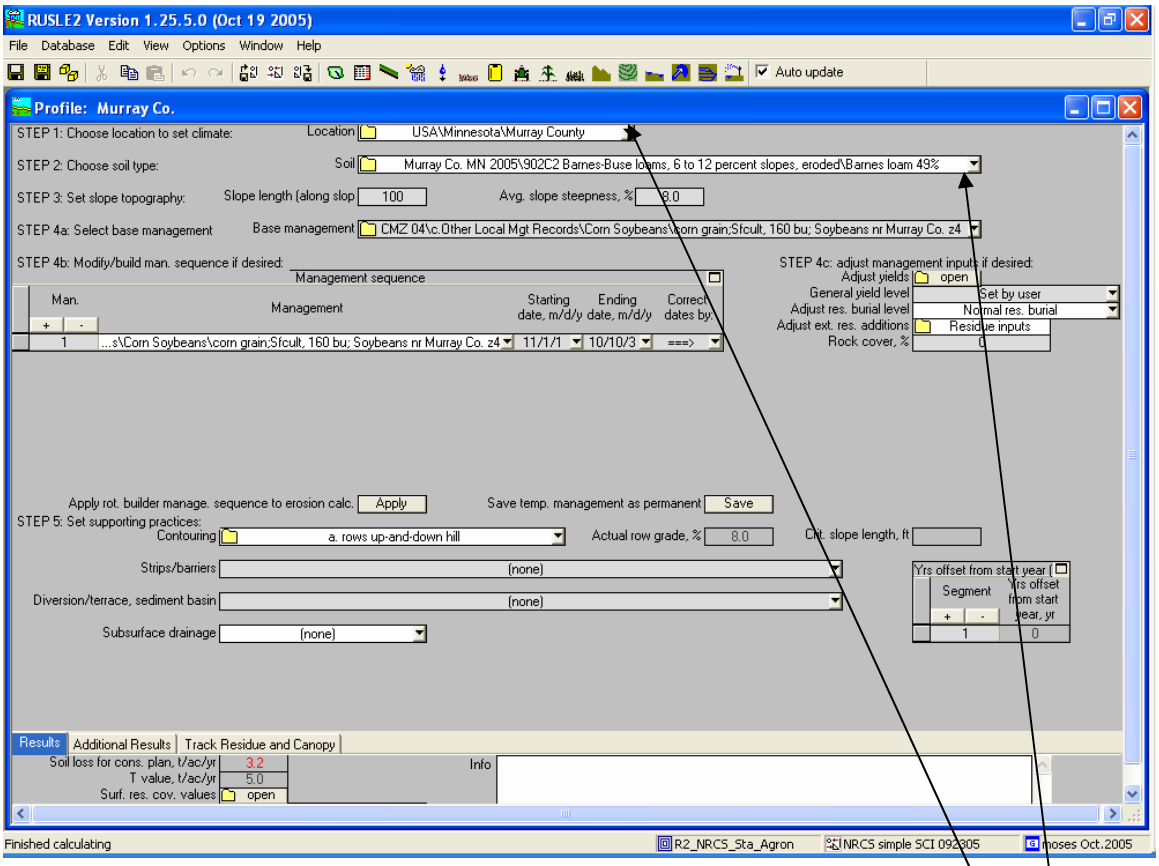
Worksheets are the third building block in the program. The Worksheet view allows you to calculate several soil loss alternatives for one field or landscape at the same time. A worksheet is composed of multiple profiles on one page. One good use of the worksheet screen is to have a number of managements (like no till, fall mulch till, spring tillage only, etc.) for a particular crop rotation (like corn – soybeans) on one worksheet. You could then get soil loss, SCI and STIR answers for each of these managements. To get

these answers for these same managements on another field, all you have to do is change the soil type, length and percent of slope on the top of the worksheet. It will calculate the answers for the managements on the new field automatically. To open the worksheet view, click on the square data sheet icon.

Plans are the fourth building block in the program. The plan view is used to calculate soil loss on multiple fields with multiple soils at one time. A plan is composed of several worksheets on one page. To open the plan view click on the green watershed icon.

THE PROFILE VIEW

Step 1: Open the profile screen.

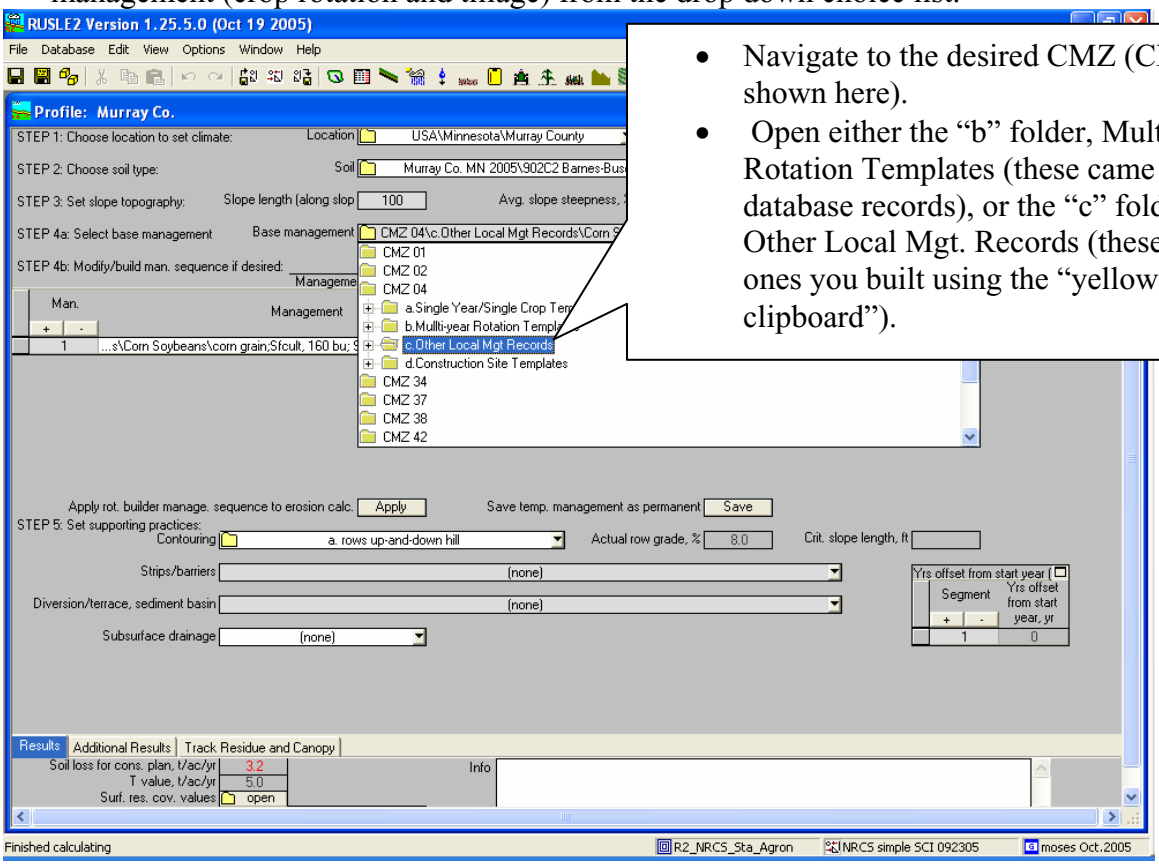


Step 2: Enter information in this screen in the order of the Steps on the screen:

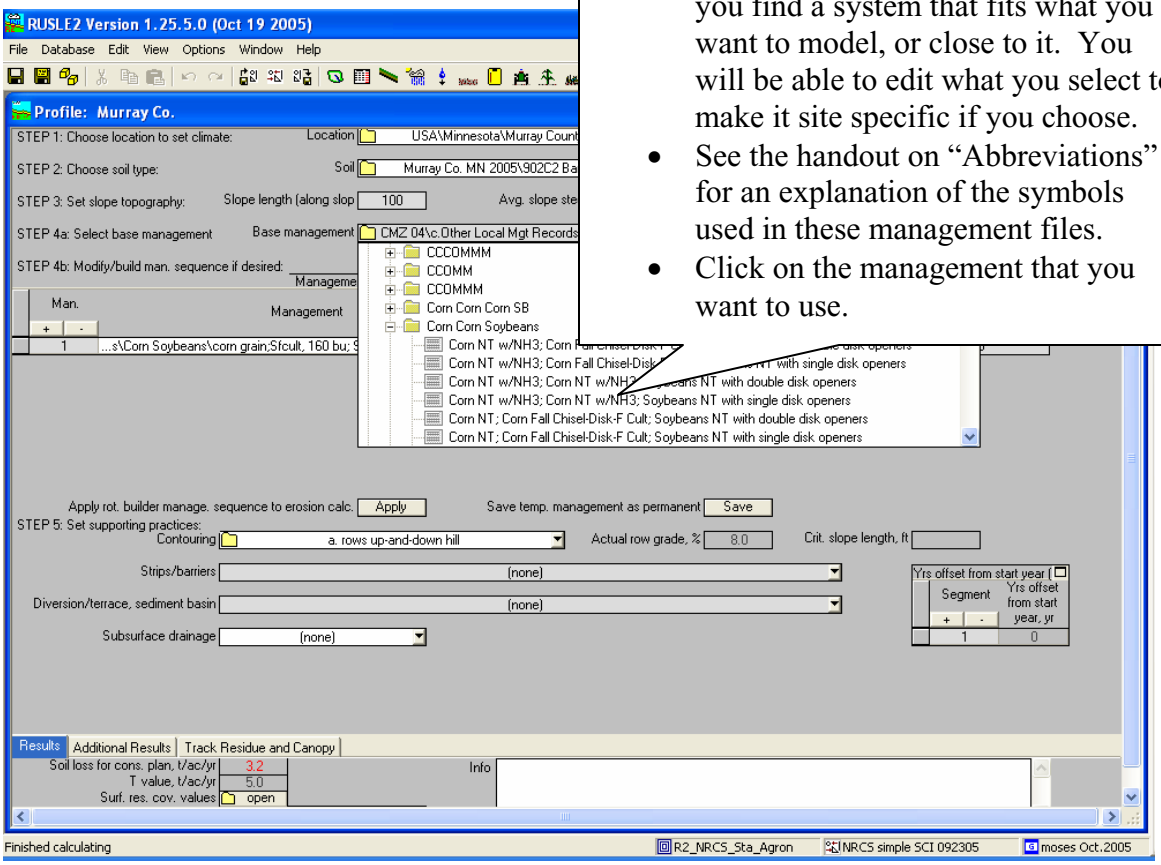
- Step 1: Select a location (county) using the drop down menu by clicking on the arrow on the right side of the box labeled "location", opening the yellow climate folder, and navigating until you find your county. Double click the county to select it.
- Step 2: Choose the soil type that you want to use for your field or landscape in the same way, by clicking on the arrow on the right side of the box labeled "Soil", navigating until you find your county. Scroll through the soil map units for your county to the one that you are looking for and click the "+" sign to display the soil

component(s). If there is only one soil component, select it; if there is more than one soil component listed, select the one that best fits the field condition you are modeling. Double click the Map Unit Component to select it.

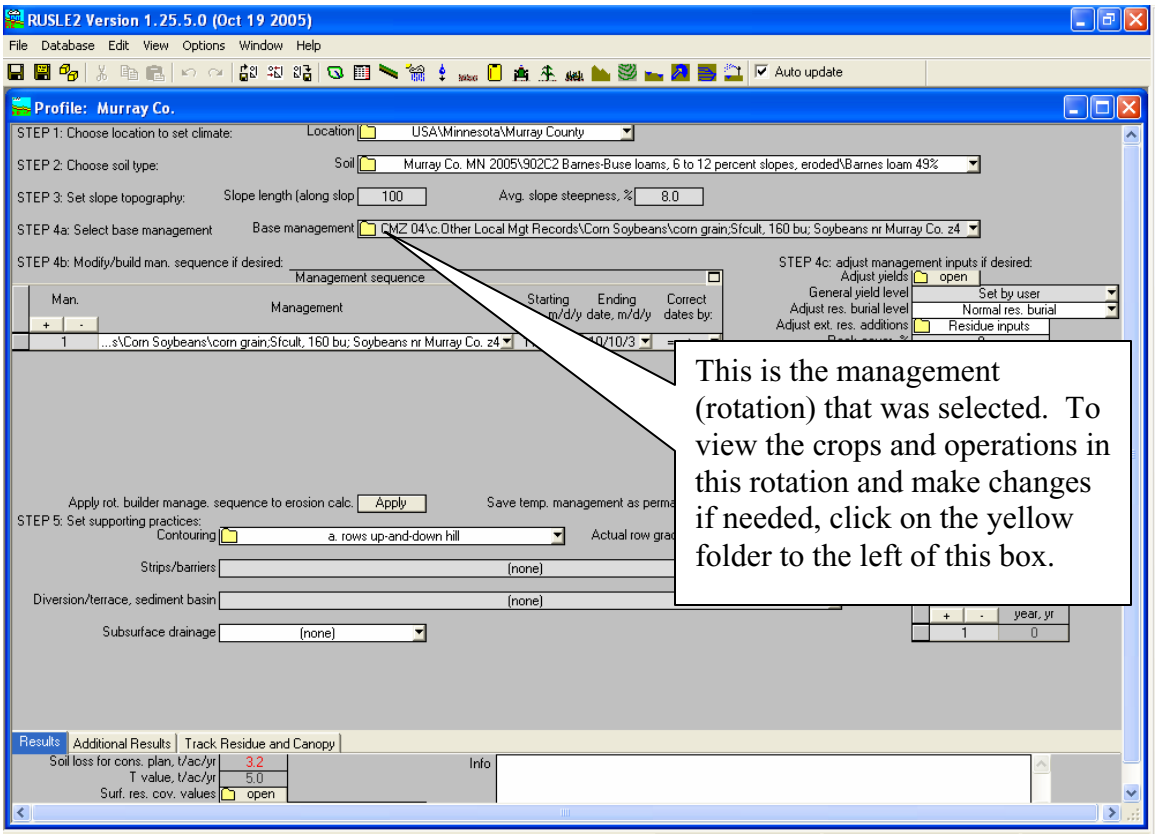
- Step 3: In the boxes for Slope length and Average slope steepness, type in the correct numbers for the soil that you selected in Step 2.
- Step 4a Select Base Management: This is the step where you will select the management (crop rotation and tillage) from the drop down choice list.

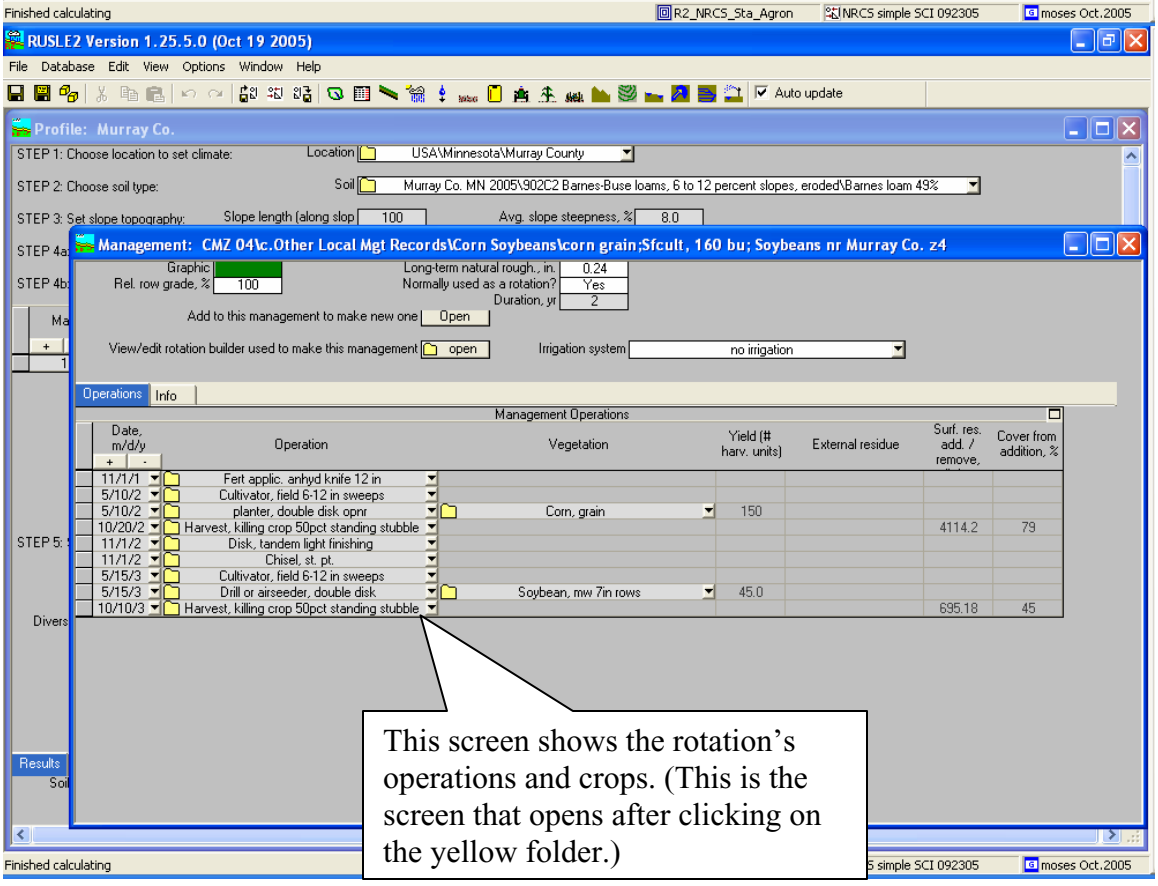


- Navigate to the desired CMZ (CMZ04 is shown here).
- Open either the "b" folder, Multiyear Rotation Templates (these came with the database records), or the "c" folder, Other Local Mgt. Records (these are the ones you built using the "yellow clipboard").



- Navigate through the choice list until you find a system that fits what you want to model, or close to it. You will be able to edit what you select to make it site specific if you choose.
- See the handout on "Abbreviations" for an explanation of the symbols used in these management files.
- Click on the management that you want to use.


RUSLE2 Version 1.25.5.0 (Oct 19 2005)
File Database Edit View Options Window Help
Auto update
Profile: Murray Co.
STEP 1: Choose location to set climate:
Location
USA\Minnesota\Murray County
STEP 2: Choose soil type:
Soil
Murray Co. MN 2005\902C2 Barnes-Buse loams, 6 to 12 percent slopes, eroded\Barnes loam 49%
STEP 3: Set slope topography:
Slope length (along slop
100
Avg. slope steepness, %
8.0
STEP 4a: Select base management
Base management
CMZ 04\c.Other Local Mgt Records\Corn Soybeans\corn grain;Sfcult, 160 bu; Soybeans nr Murray Co. z4
STEP 4b: Modify/build man. sequence if desired:
Management sequence
Man.
Management
Starting m/d/y
Ending date, m/d/y
Correct dates by:
1
...s\Corn Soybeans\corn grain;Sfcult, 160 bu; Soybeans nr Murray Co. z4
STEP 4c: adjust management inputs if desired:
Adjust yields
open
General yield level
Set by user
Adjust res. burial level
Normal res. burial
Adjust ext. res. additions
Residue inputs
Apply rot. builder manage. sequence to erosion calc.
Apply
Save temp. management as perma
STEP 5: Set supporting practices:
Contouring
a. rows up-and-down hill
Strips/barriers
(none)
Diversion/terrace, sediment basin
(none)
Subsurface drainage
(none)
year, yr
1
0
This is the management (rotation) that was selected. To view the crops and operations in this rotation and make changes if needed, click on the yellow folder to the left of this box.
Results
Additional Results
Track Residue and Canopy
Soil loss for cons. plan, t/ac/yr
3.2
T value, t/ac/yr
5.0
Surf. res. cov. values
open
Info
Finished calculating
R2_NRCS_Sta_Agron
NRCS simple SCI 092305
moses Oct.2005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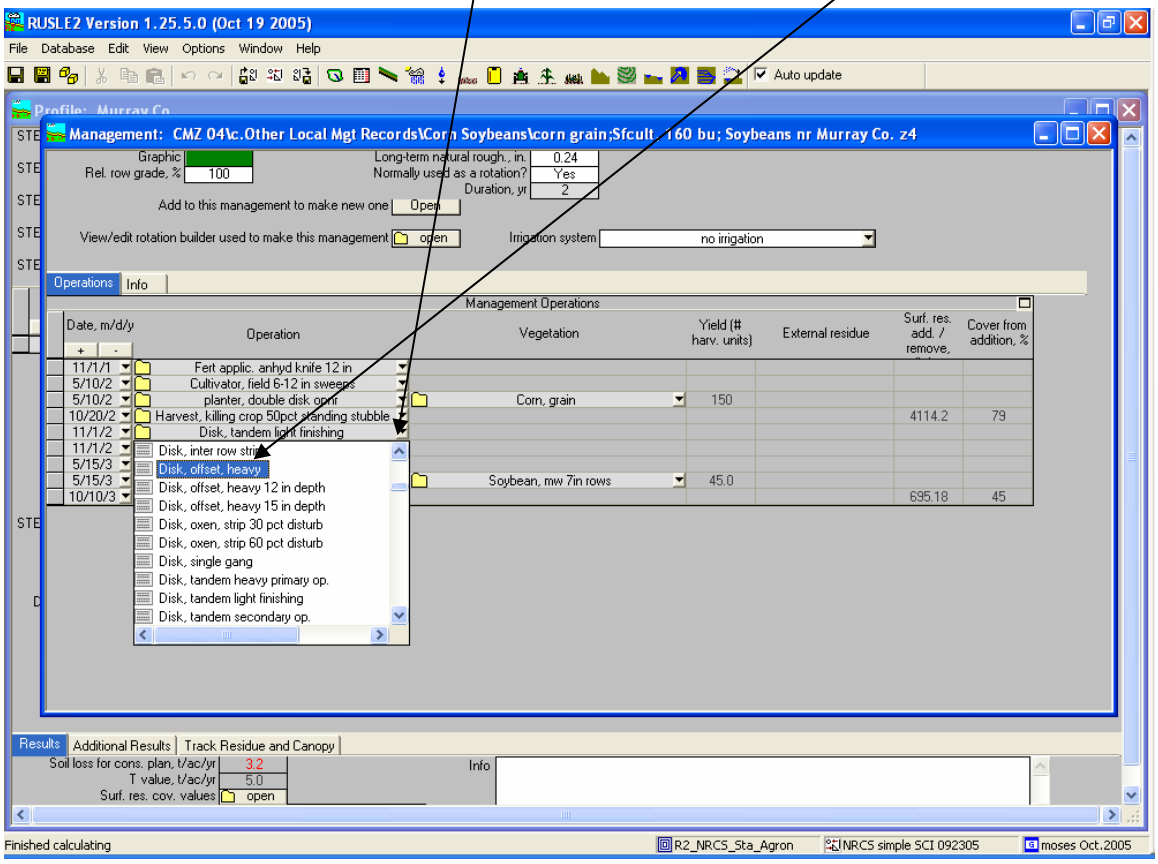
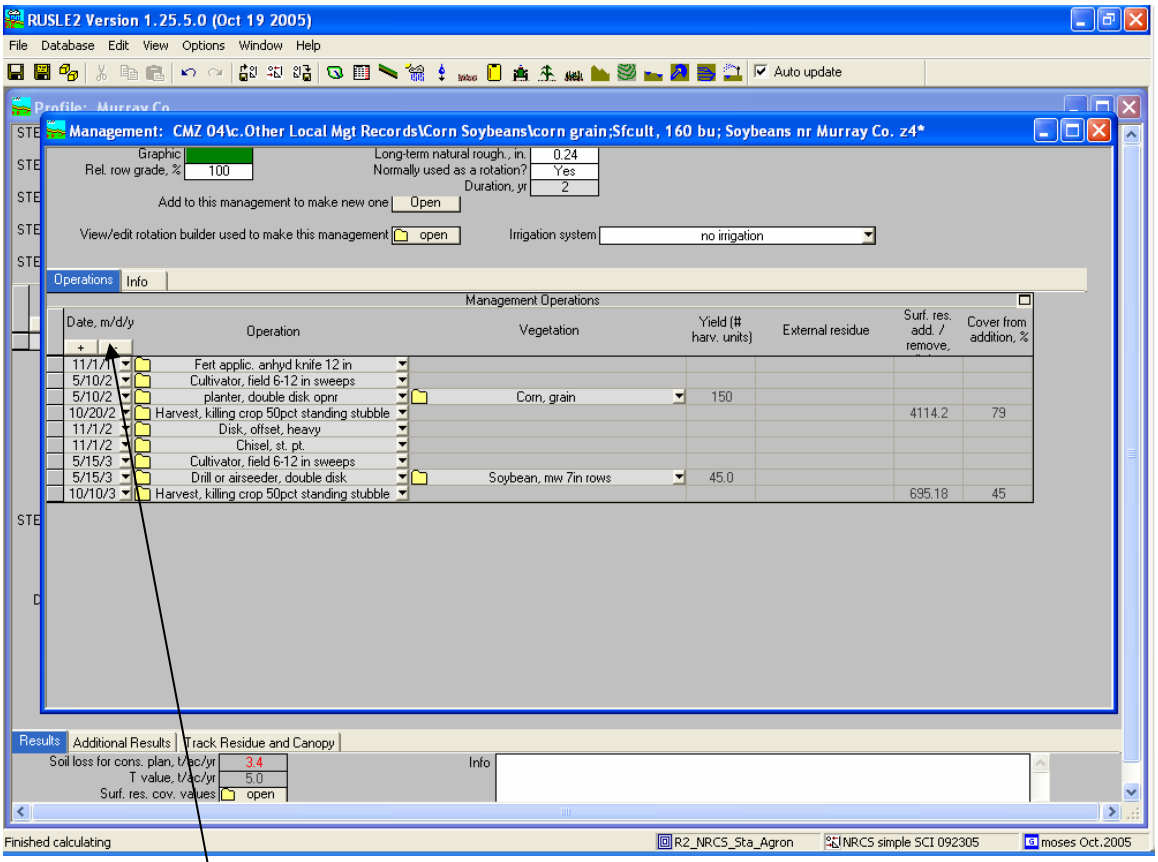
Murray Co. MN 2005\902C2 Barnes-Buse loams, 6 to 12 percent slopes, eroded\Barnes loam 49%
STEP 3: Set slope topography:
Slope length (along slop
100
Avg. slope steepness, %
8.0
Management: CMZ 04\c.Other Local Mgt Records\Corn Soybeans\corn grain;Sfcult, 160 bu; Soybeans nr Murray Co. z4
Graphic
Rel. row grade, %
100
Long-term natural rough., in.
0.24
Normally used as a rotation?
Yes
Duration, yr
2
Add to this management to make new one
Open
View/edit rotation builder used to make this management
open
Irrigation system
no irrigation
Operations
Info
Management Operations
Date, m/d/y
Operation
Vegetation
Yield (# harv. units)
External residue
Surf. res. add. / remove,
Cover from addition, %
11/1/1 Fert applic. anhyd knife 12 in
5/10/2 Cultivator, field 6-12 in sweeps
5/10/2 planter, double disk opnr
Corn, grain
150
10/20/2 Harvest, killing crop 50pct standing stubble
4114.2
79
11/1/2 Disk, tandem light finishing
11/1/2 Chisel, st. pt.
5/15/3 Cultivator, field 6-12 in sweeps
5/15/3 Drill or airseeder, double disk
Soybean, mw 7in rows
45.0
10/10/3 Harvest, killing crop 50pct standing stubble
695.18
45
This screen shows the rotation's operations and crops. (This is the screen that opens after clicking on the yellow folder.)
Results
Finished calculating
moses Oct.2005

Revising the Management

Once the management has been opened (above), you can make changes in the operations listed. In this example, if you wanted to change the operation after harvesting corn from “Disk, tandem light finishing” to “Disk, offset, heavy”, you would click on the drop down arrow on the right side of the line next to “Disk, Tandem”. Navigate through the choice list to select “Disk, offset, heavy” and click on it to choose this operation.





We now show the Disk, offset, heavy in this rotation in place of the Disk, tandem, light finishing. Other operations can be changed in the same way. If you simply want to delete one of the operations, click on the operation you want to delete and hit the "-"sign at the top of the column. To add an additional operation, click on the row directly above where you want to add the operation and click the "+" button at the top of the column. This will copy the row – you will now have two rows that are exactly the same. Use the drop down arrow on the left side of the line, just like before, to access the list of equipment. The "Tillage Equipment Pocket Identification Guide" has pictures and definitions of much of the equipment in the "operations" list.

You may also have to change the date on your new line, if the tillage is done on a different day than the operation on the line above. Be very careful that the dates are in order – each line must be the same or later than the line above it, or you will get an error message.

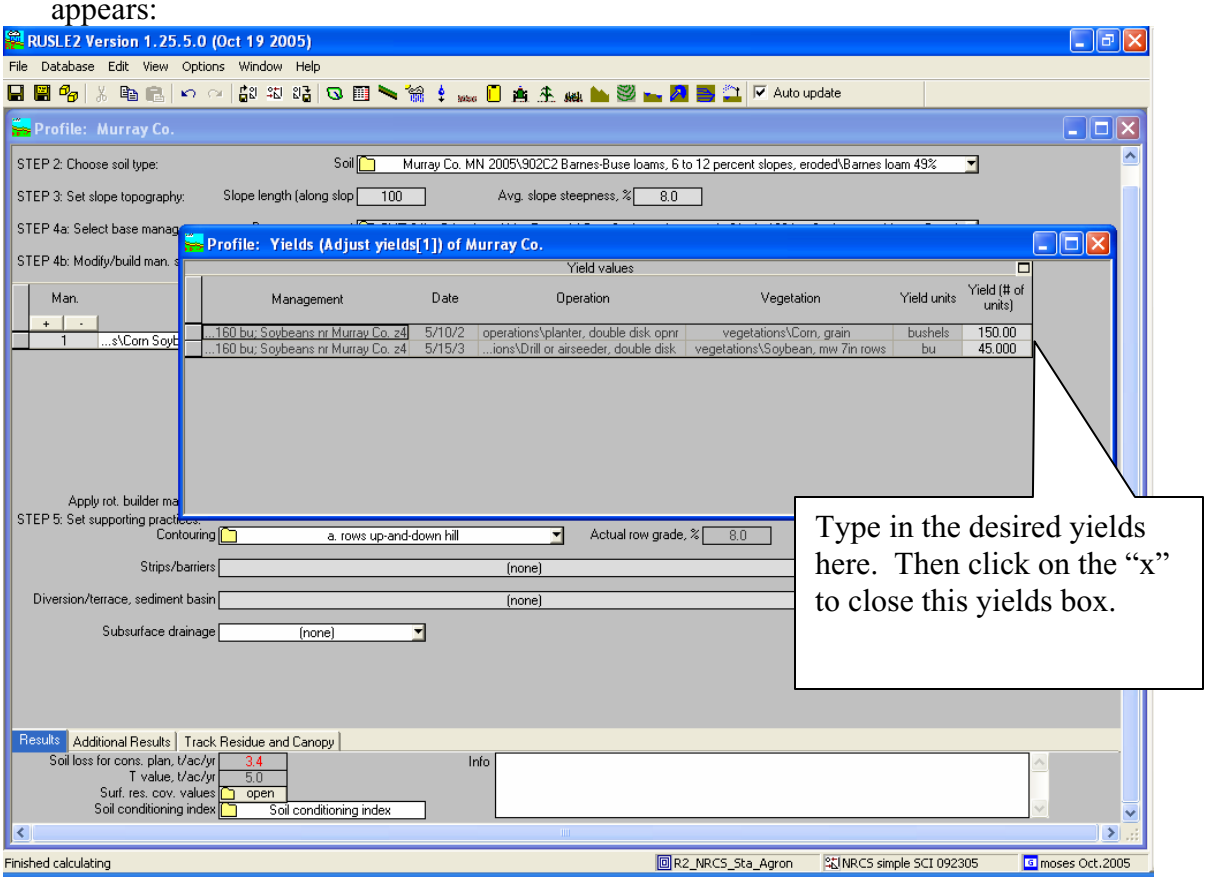
DO NOT CHANGE ANY OF THE OTHER DATES LISTED. These are set average dates for the crops and operations in each crop management zone, and are not to be changed except for very limited circumstances. See the "Additions to RUSLE2 Users Guide" for additional information on dates.

In general, you should not have to made changes to the management you selected very often because there are quite a few tillage variations available to use when building these management files (rotations). See the handout "Building a new rotation in RUSLE2" for

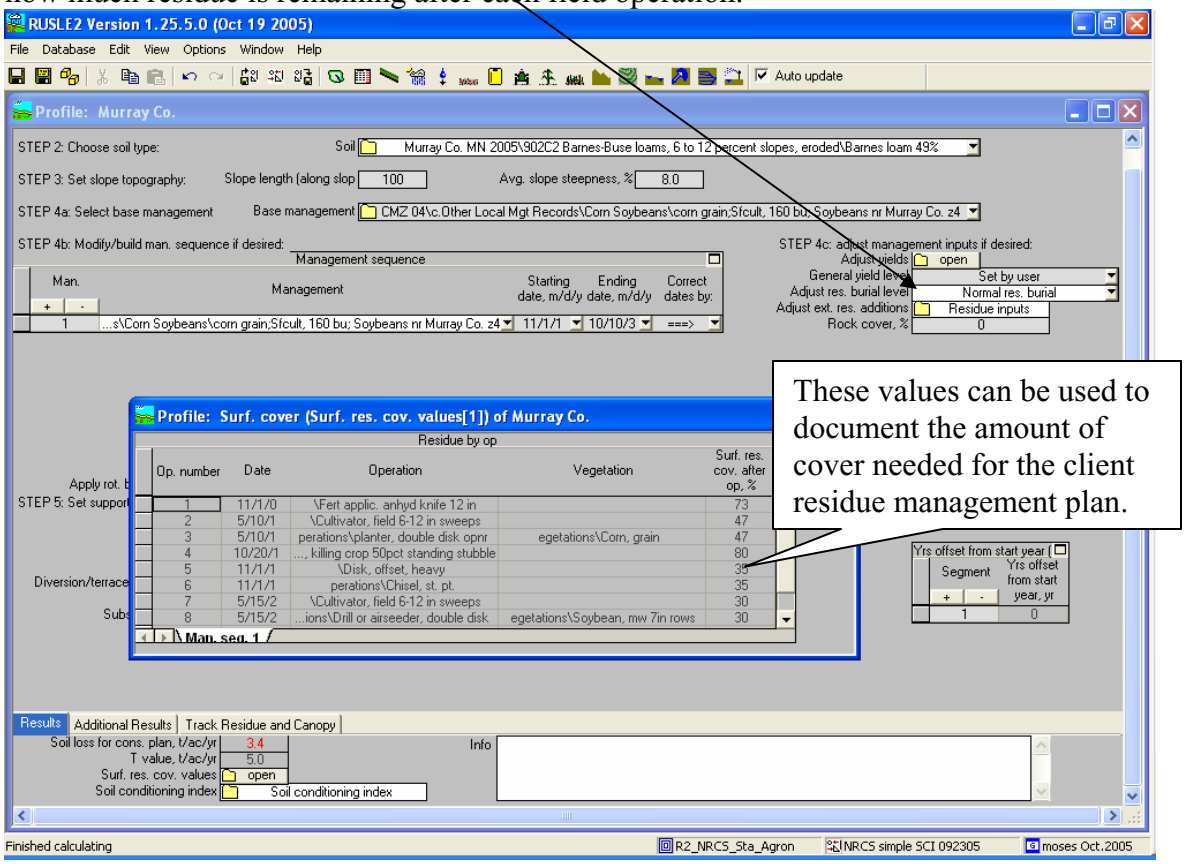
additional instructions in building rotations from scratch. Most of the time in the profile view, you will be using rotations that have already been built.

When you are done looking at / changing the management, click the "x" in the upper right hand corner of the management screen to close this window. If you made any changes to the management, the program will ask you if you want to save your changes. If you say "yes" the management will be saved with the changes that you made.

- Step 4b: Modify / build a management sequence if desired: This step in the profile can be used to build rotations (managements) from scratch. Most of the time we will build our rotations directly from the management screen (the yellow clipboard). That process is described in a separate document. This step (4b) will not be used often on the profile screen because rotations will already have been built.
- Step 4c: Adjust management inputs if desired: This step allows you to change the crop yields, residue burial level and external residue additions. The average crop yields were set in the management screen when the crop rotation was built. They can be changed here, in the profile if necessary. Changes made here will apply only to the profile – they will not change in the original management. Click on the yellow folder next to the "adjust yields" dialog box. – the screen below appears:



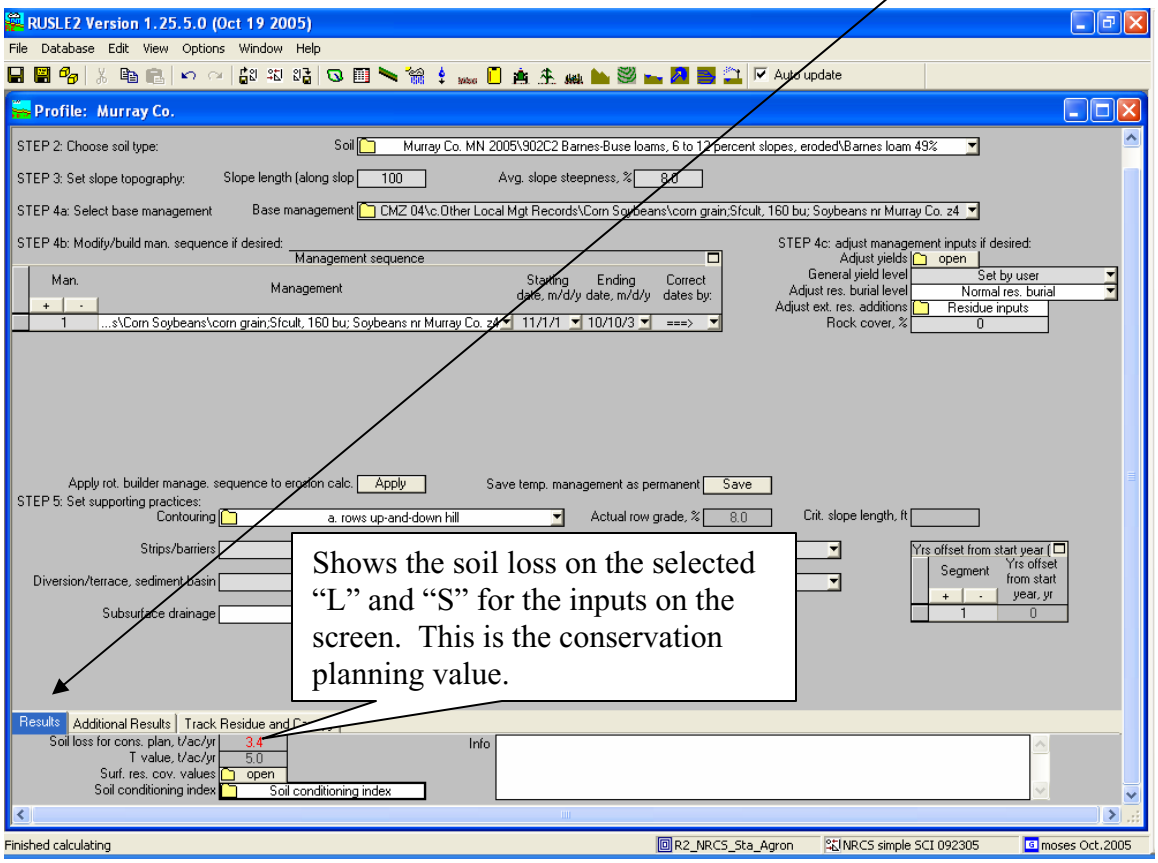
- The “adjust residue burial levels” box is used when you have a special circumstance and you want to make the program bury more or less residue with each tillage operation than the average. This is usually only done when you have a special reason to think that the residue calculations in the program need to be adjusted. The choices in the drop down box for this item will tell the program to bury 10%, 20% or 30% more or less than normal. The “Surface Residue Cover Values” folder under the “Results” tab (shown in the screen below) will show how much residue is remaining after each field operation.



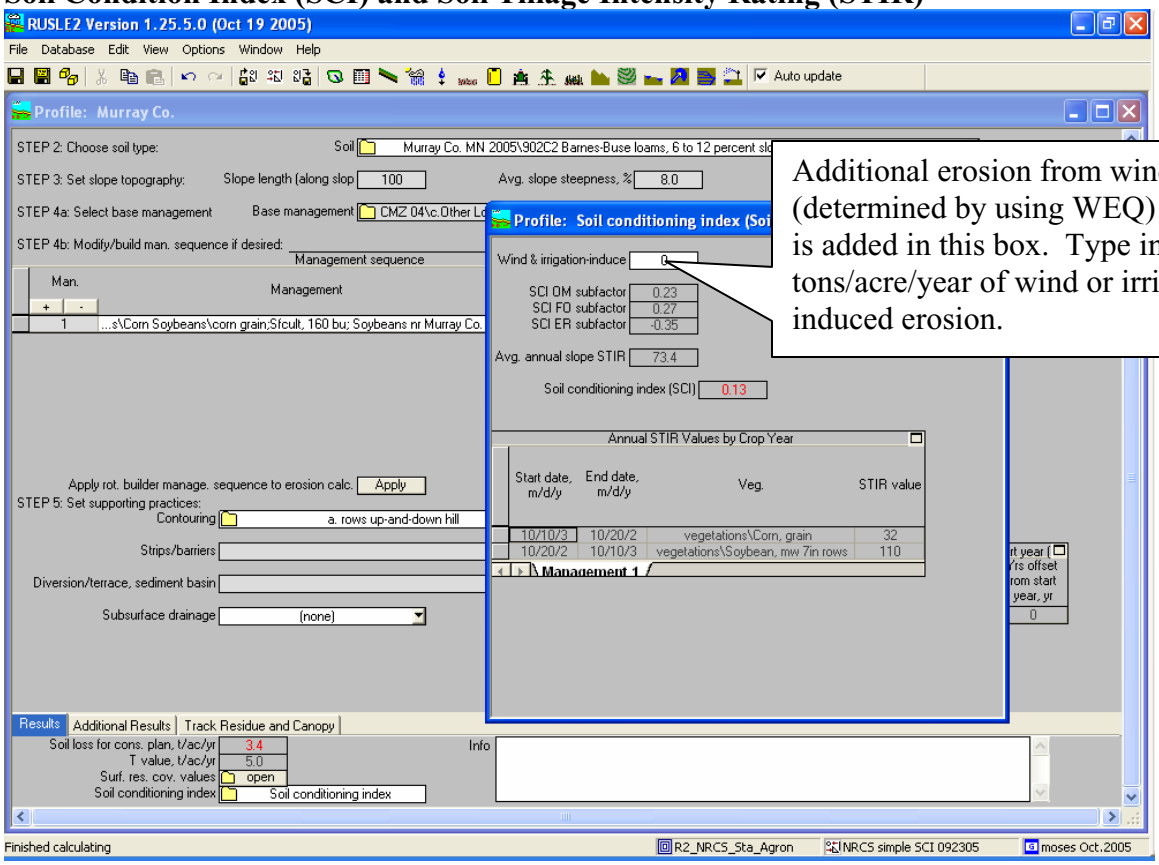
- The “Adjust ext. res. Additions” box is used when a source of external residue (such as manure) was added in the management screen. This is where you would enter the amount of residue added, in pounds per acre.

- The last button for “Rock Cover” is not used in Minnesota.

Step 3: You are now ready for either Step 5 (on the screen), which is "Set supporting practices" or to get answers. If there are no supporting practices on the field you are modeling, go directly to the bottom of the page, to the set of "Results" tabs.



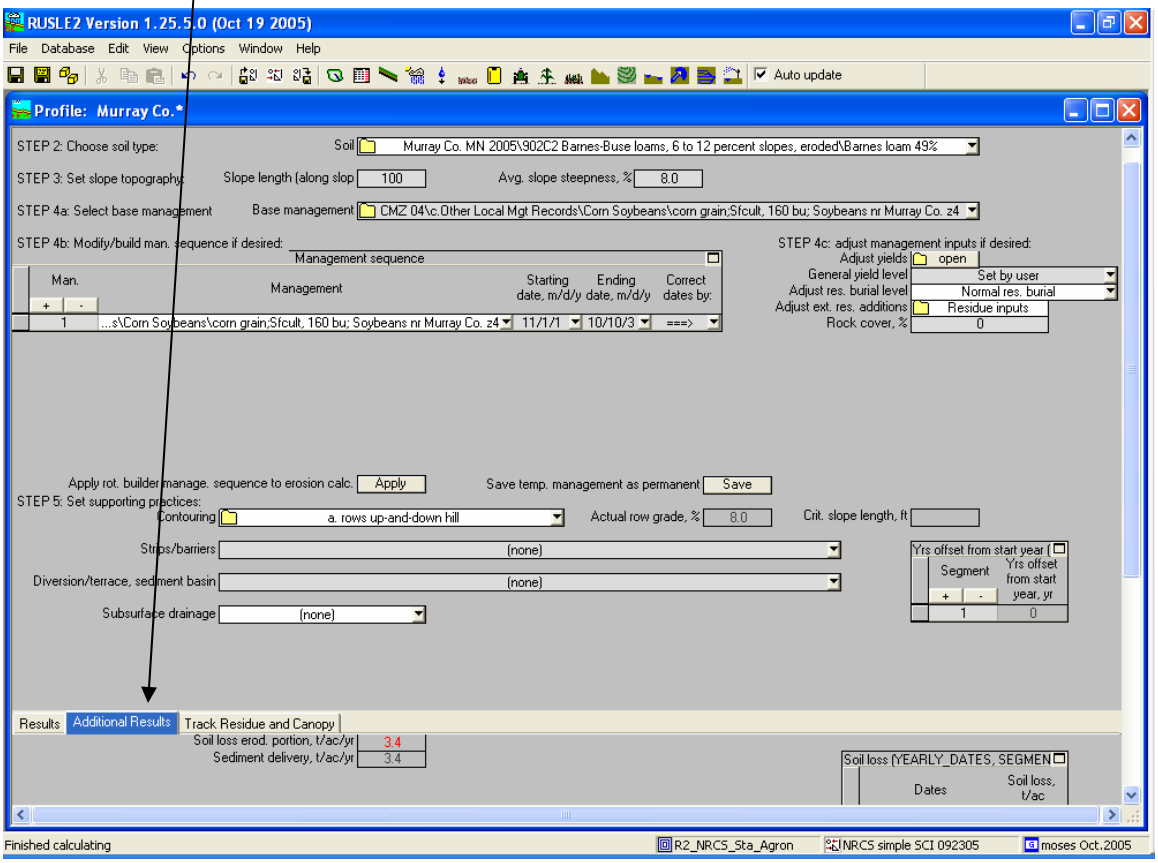
Soil Condition Index (SCI) and Soil Tillage Intensity Rating (STIR)



Additional erosion from wind (determined by using WEQ) or irrigation is added in this box. Type in the tons/acre/year of wind or irrigation induced erosion.

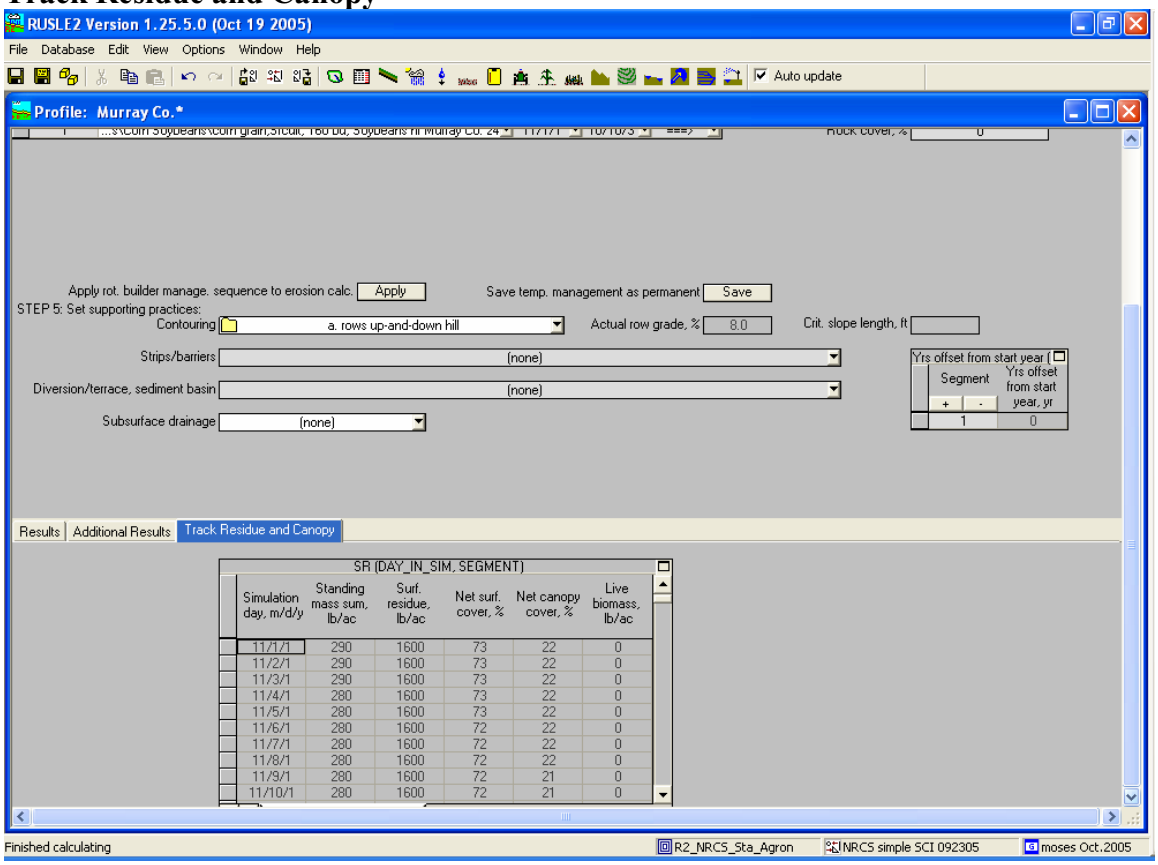
- Click on the yellow folder next to the **Soil Conditioning Index** box. It will open the SCI / STIR dialogue box (above). This is where you enter additional erosion that is occurring on the field from wind or irrigation. The soil conditioning index for the rotation is displayed. The program also gives you the <u>average</u> annual slope STIR (the average for the rotation) and the <u>Annual</u> STIR value by Crop Year. The Annual STIR value by Crop Year is referred to in a number of conservation practice standards, including no-till.

Additional Results Tab



- This tab gives you two soil loss answers – one for the eroding portion of the slope and one for the sediment delivery. The soil loss used for conservation planning (under the Results tab, previous) is a combination of these two numbers. The soil loss numbers under the Additional Results tab are not used for conservation planning; they are used more for research purposes. You can highlight each of these choices and right click to get a more detailed explanation of what these numbers mean.

Track Residue and Canopy

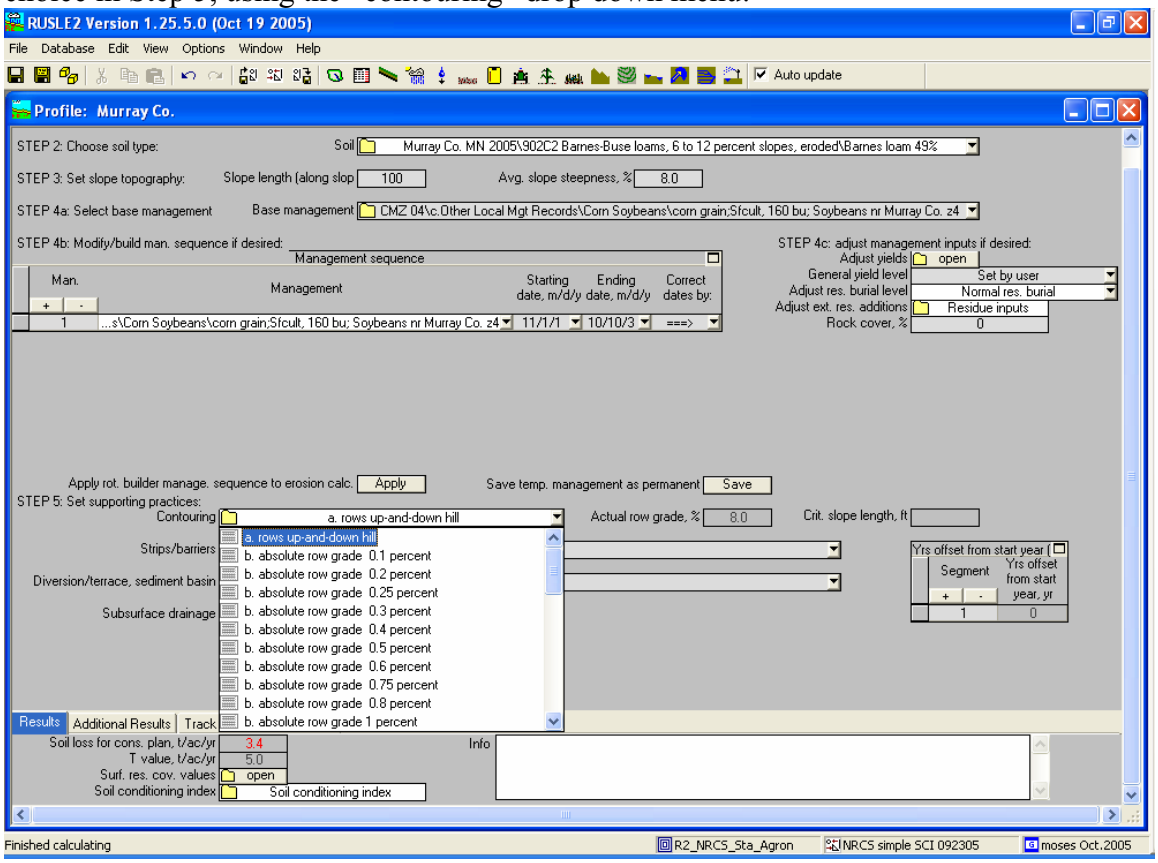


This is a new button with the October 2005 version of RUSLE2. It displays more output – a table with the surface residue (lb/ac), net surface cover (%), net canopy cover (%) and live biomass by day. Again, this information is used mostly for research purposes.

Guidance for Step 5: Set Supporting Practices

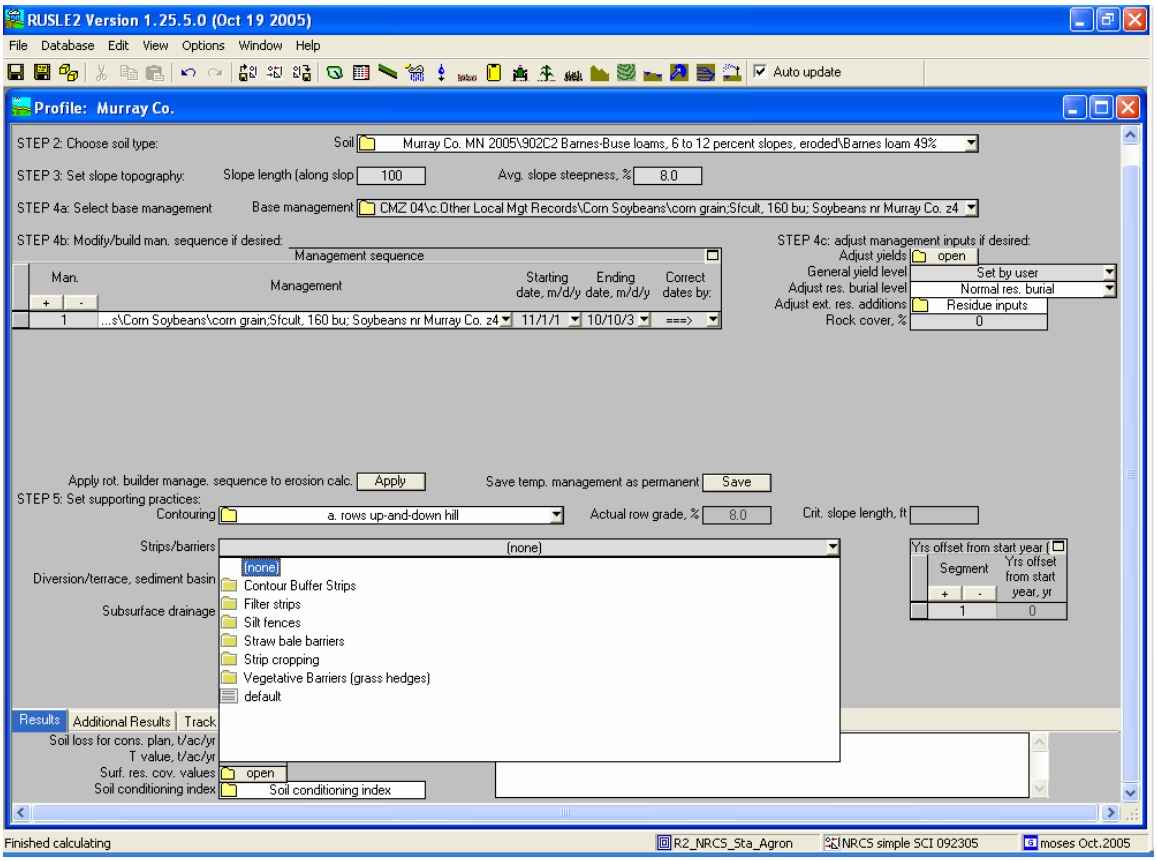
1. CONTOURING

If contouring is used on the field or landscape you are modeling, enter the appropriate choice in Step 5, using the "contouring" drop down menu:



- Use only the absolute row grades. The row grade means the percent of grade off the contour: e.g. Absolute row grade of 1% means the contouring is actually on a 1% grade across the slope – not a perfect contour. There is one choice in the list for Perfect Contouring – no row grade. A row grade of 2 percent is the maximum allowed in the NRCS Contour Farming practice standard. Row grades steeper than 2 percent are considered to be cross slope farming and may be credited in this box when farming operations and planted rows are aligned generally perpendicular to the dominant slope of the field and in-row grades do not exceed one half of the dominant slope used for erosion prediction on the field. The dominant slope used for erosion prediction is the slope you entered in Step 3 of the profile screen.

2. STRIPS / BARRIERS

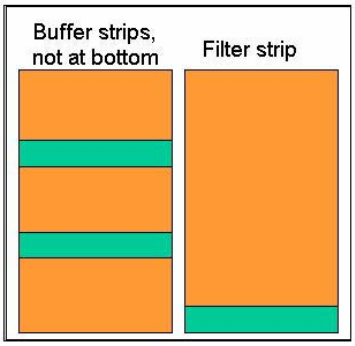


When you click on the drop down box for this option, you get the choice list above. Additional information about these choices is available by putting your curser over the word “Strips/barriers” and right clicking. You will get a menu, and one of the menu choices is “help”. This will give you help about Strips and barriers (see example, below).

Help

Strips/barriers:

Strips/barriers are used to describe practices where strips of dense vegetation or other types of barriers are placed on the slope to slow and spread runoff to cause deposition, reduce rill erosion, and extend critical slope length. Strips and barriers can also be placed at the end the slope as sediment control measures. Strips and barriers can be described, named, saved, and selected to use as a practice.



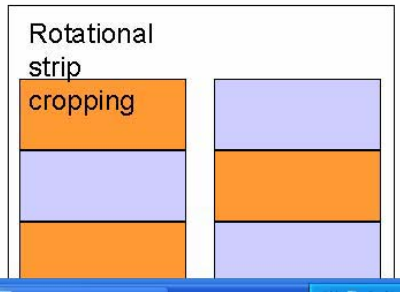
The main features that describe strips are number on the slope length, whether or not the bottom strip on the slope is placed at the end of the slope, and the management practice for the strip. RUSLE2 considers three types of strips, which are buffer strips, filter strips, and rotational strip cropping. Examples of these types of strips have been created and saved in the database that comes with RUSLE2.

Buffer strips are single or multiple narrow strips of permanent, dense vegetation placed at uniform intervals along the slope determined by number and depending on whether the last strip is at the end of the slope. Width of the strip can be specified based on percent of slope length or in absolute units. A management practice has to be specified for each strip, which determines its effectiveness.

A buffer strip system where water quality the the conservation planning objective according to USDA-NRCS specifications is one where the bottom strip is at the end of the slope length and is twice as wide as the other strips.

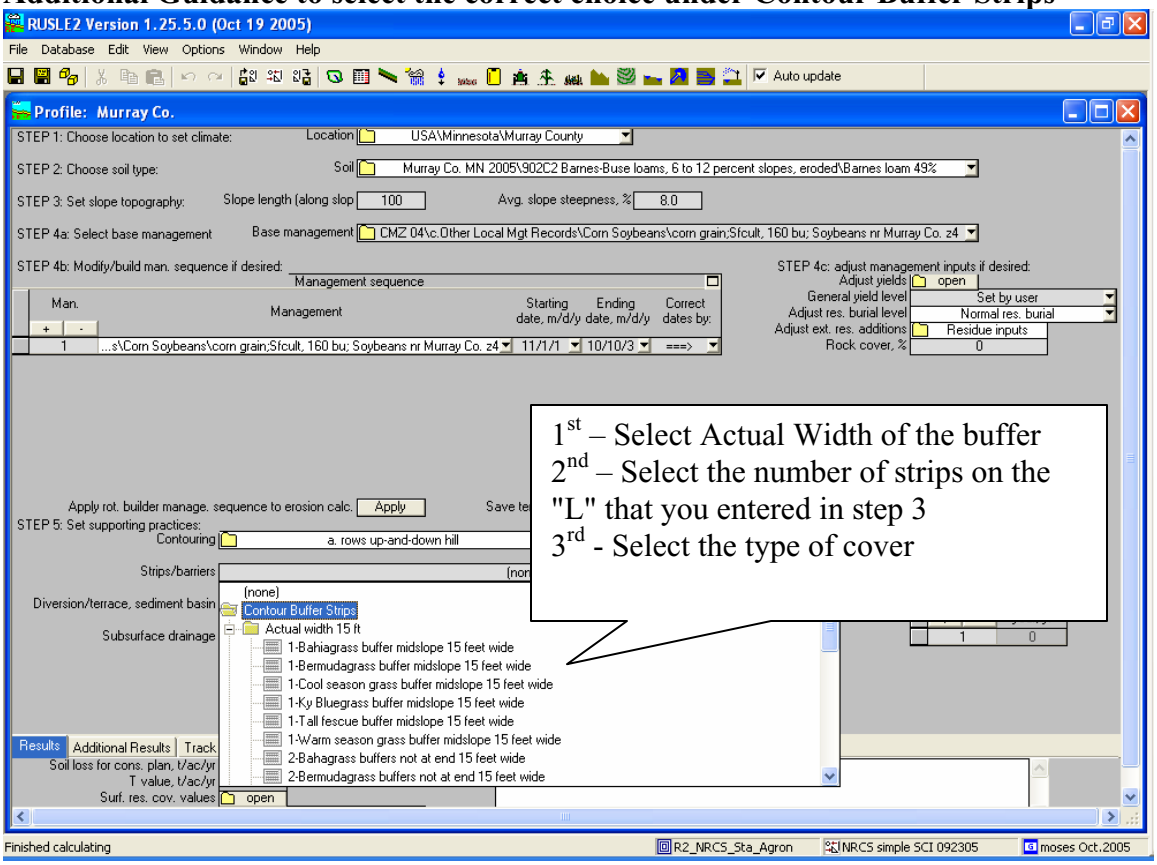
A filter strip system is a special case of the buffer strip system where a single strip is placed at the end of the slope.

A rotational strip cropping system is one where the strips are of equal width and the management is rotated annually among the strips according to the operations and crops in the management system, which must be at least two years long, but generally about five or more years. For example, a typical rotation in a strip cropping system could be two years of corn followed by three years of hay. The strips are arranged so highly erodible strips like clean tilled corn are separated by erosion-resistant strips of hay.

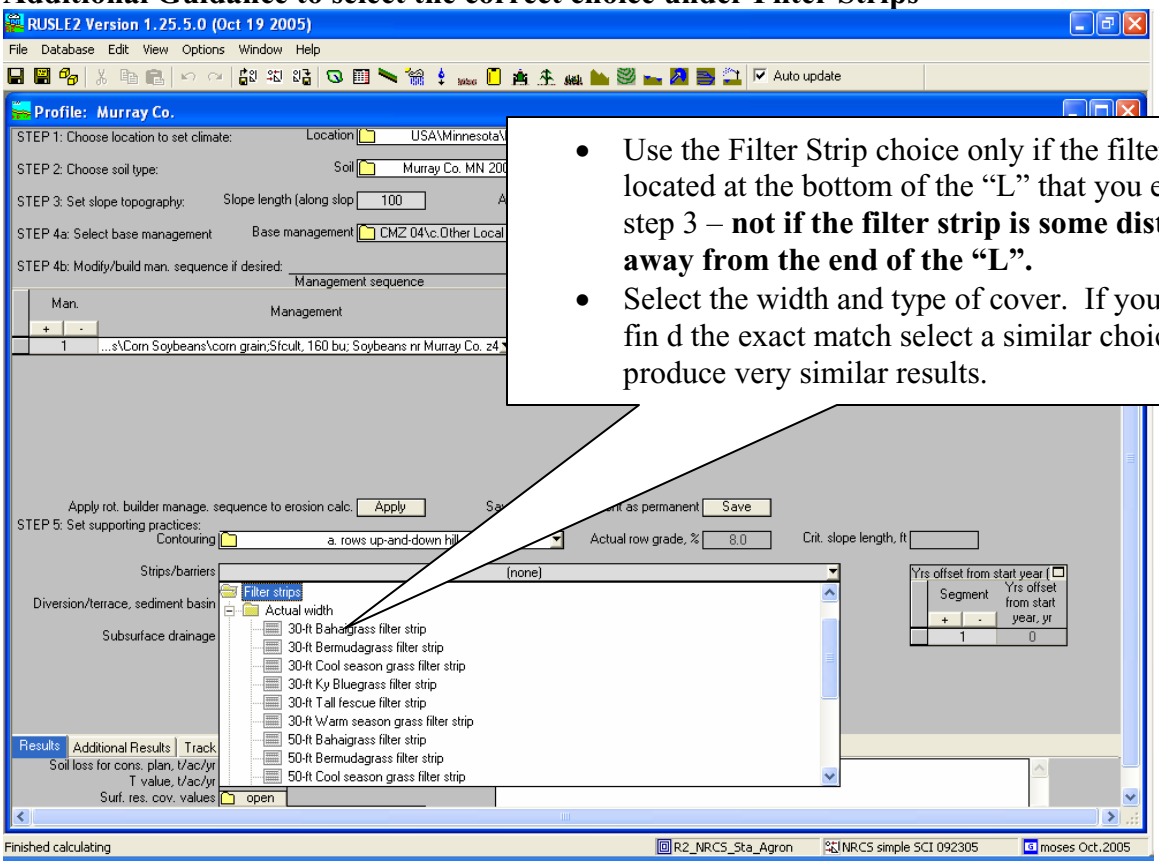


Thus, a key input is the number of years to offset the rotation in each strip to achieve such an alternating pattern of strips. The following table illustrates how to choose the years for the offset. The example rotation is corn-corn-hay-hay-hay for a rotation with four strips. Notice that hay strips are on the slope every year so the highly erodible corn strips are never on the slope alone.

Additional Guidance to select the correct choice under Contour Buffer Strips

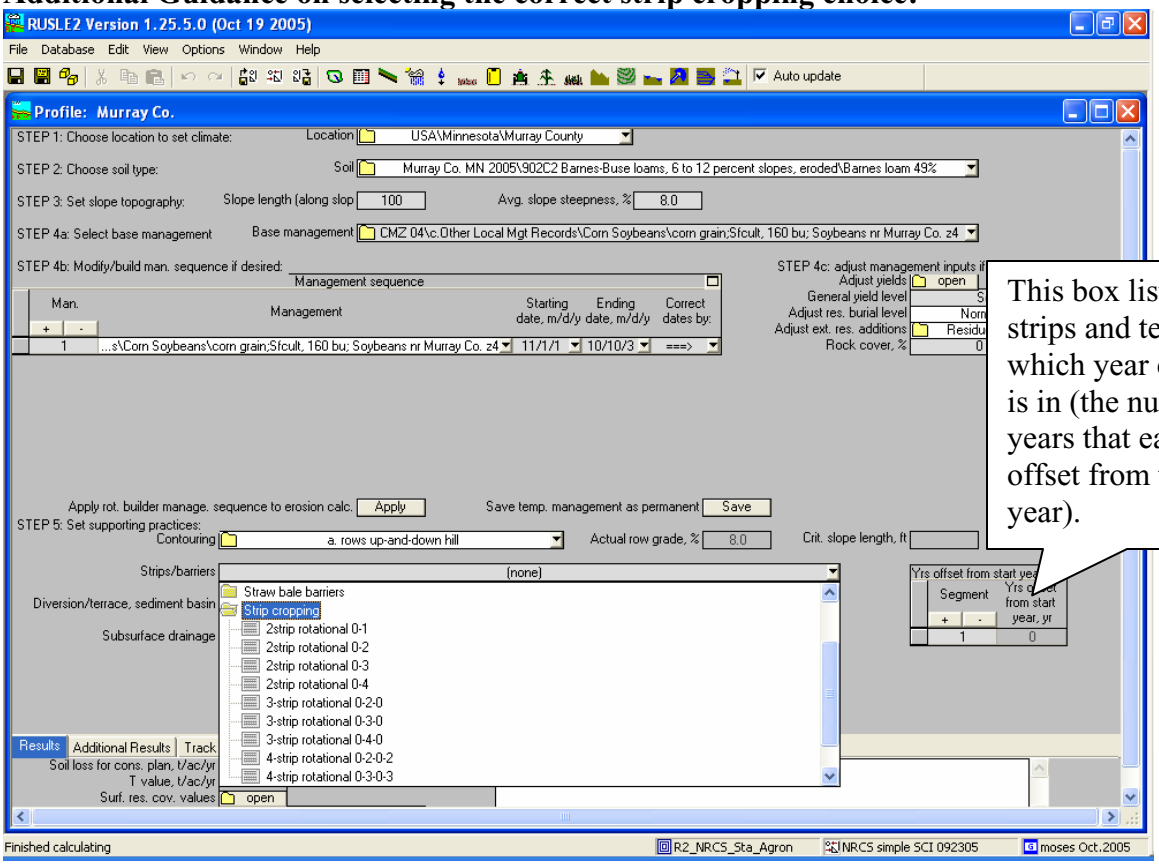


Additional Guidance to select the correct choice under Filter Strips



- Use the Filter Strip choice only if the filter strip is located at the bottom of the "L" that you entered in step 3 – **not if the filter strip is some distance away from the end of the "L".**
- Select the width and type of cover. If you do not fin d the exact match select a similar choice – most produce very similar results.

Additional Guidance on selecting the correct strip cropping choice:



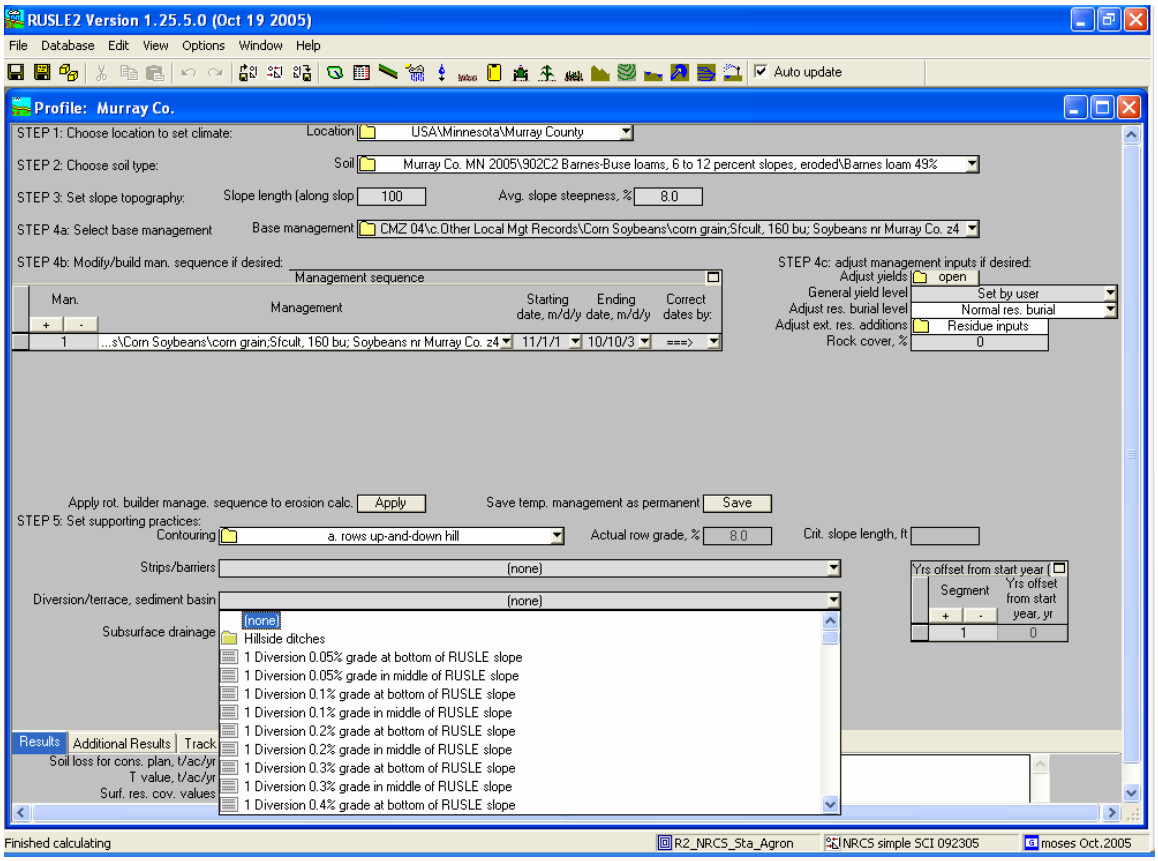
This box lists all of the strips and tells you which year each strip is in (the number of years that each strip is offset from the Start year).

- Unless your slope length is longer than 200 feet, you probably only have two strips on the "L". You are describing how many strips are on the "L" you entered in step 3, not how many are on the entire field.
- The 2Strip rotational 0-1 means: 2 strips on the "L" and the 1st and 2nd crop in the rotation are next to each other (this would be a two year rotation). "0-2" means the 1st and 3rd crops in the rotation are in strips next to each other (this would be a four year rotation like corn-oats-hay-hay, where corn and the 1st year hay are adjacent to each other. The box labeled "Years offset from Start year" on the right side of the screen. This box is for information - there are no entries here. It populates automatically when you have chosen a strip cropping system in the profile.

Vegetative Barriers refers to Conservation Practice Standard 601. This practice is not widely used in Minnesota.

Silt Fences and Straw Bales & Barriers are used mostly on construction sites.

3. DIVERSION/TERRACE SEDIMENT BASIN



- Hillside ditches refers to practice standard 423, which we do not have in Minnesota, so we will not be using this choice.
- The "help" menu for this choice gives a good explanation. This is used mostly for terraces and diversions. RUSLE2 is used to predict sheet and rill erosion, not gulley erosion, so if sediment basins (Practice Code 638) are the only practice that has been installed on the "L" and the purpose was for gulley erosion control, then do not use this choice.
- You are describing how many terraces or diversions are on the "L" you entered in step 3, not how many are on the entire field.
- See the additional guidelines for terraces in the Additions to RUSLE2 Users Guide handout.

4. **SUBSURFACE DRAINAGE:** Read the information under the "help" choice for an explanation of this button. There are only two choices, and neither one appears to make a difference in your answer at this time.

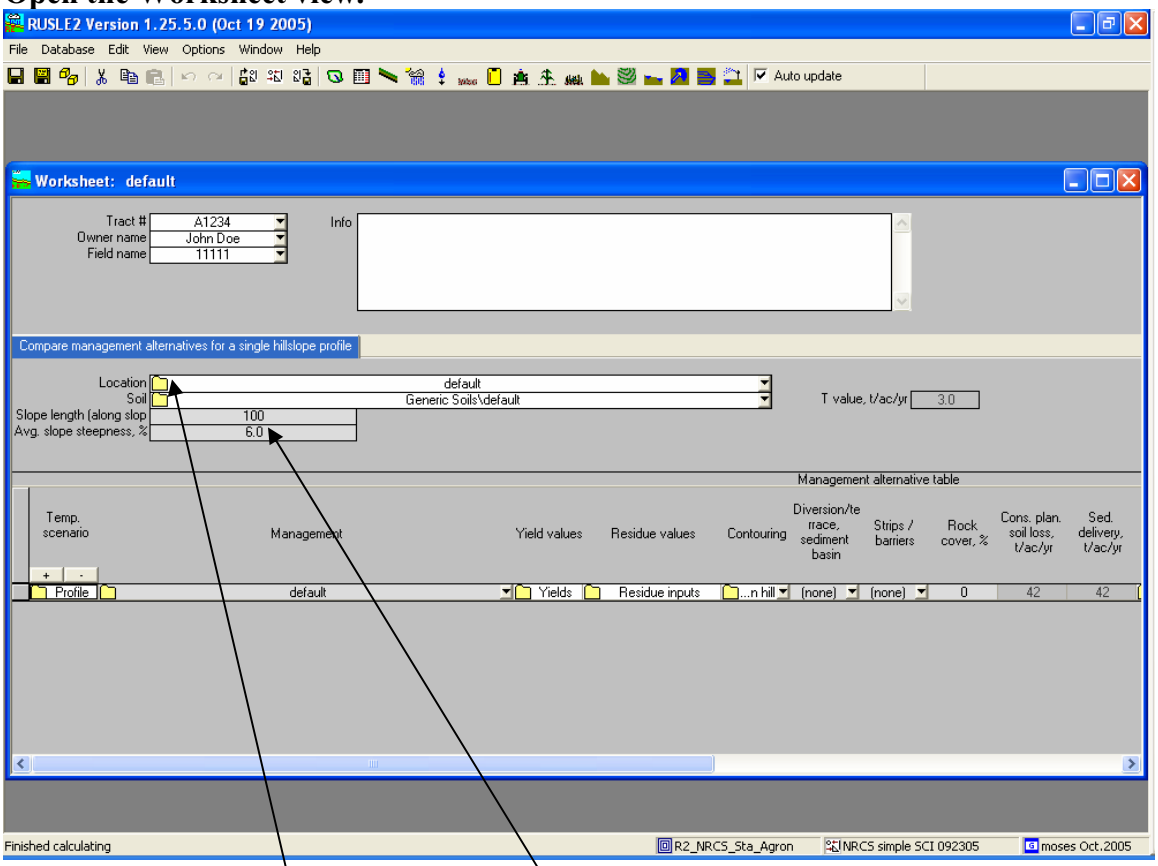
Saving

The profiles you create may be saved in the program for use in the future. Go to the Toolbar, to *File, save as.* Click on this option. You will get a screen that says "Save As". At the bottom of the screen, type in a name for the profile and hit "*save*". The profile will be saved and available for you to use the next time you open the program.

Printing: Instructions for printing are on page 9 in the "Additions to RUSLE2 Users Guide".

THE WORKSHEET VIEW

Open the Worksheet view.



- The first time you open this screen, there will be a "default" choice as your only option. Click on "default" to get the worksheet above.
- The boxes for "Tract #", "Owner name" and "Field name" can be edited if you want to. Just highlight the box and type in the information that you want. The drop down arrow on the right side of the box will expand it to a larger size. The same is true for the larger "Info" box.
- Enter the location (county) and the soil for the field or landscape that you want to model, the same way you did in the profile screen.
- Enter information in the boxes for "Slope Length" and "Avg. slope steepness" the same as you did in the profile, by typing in the appropriate information.
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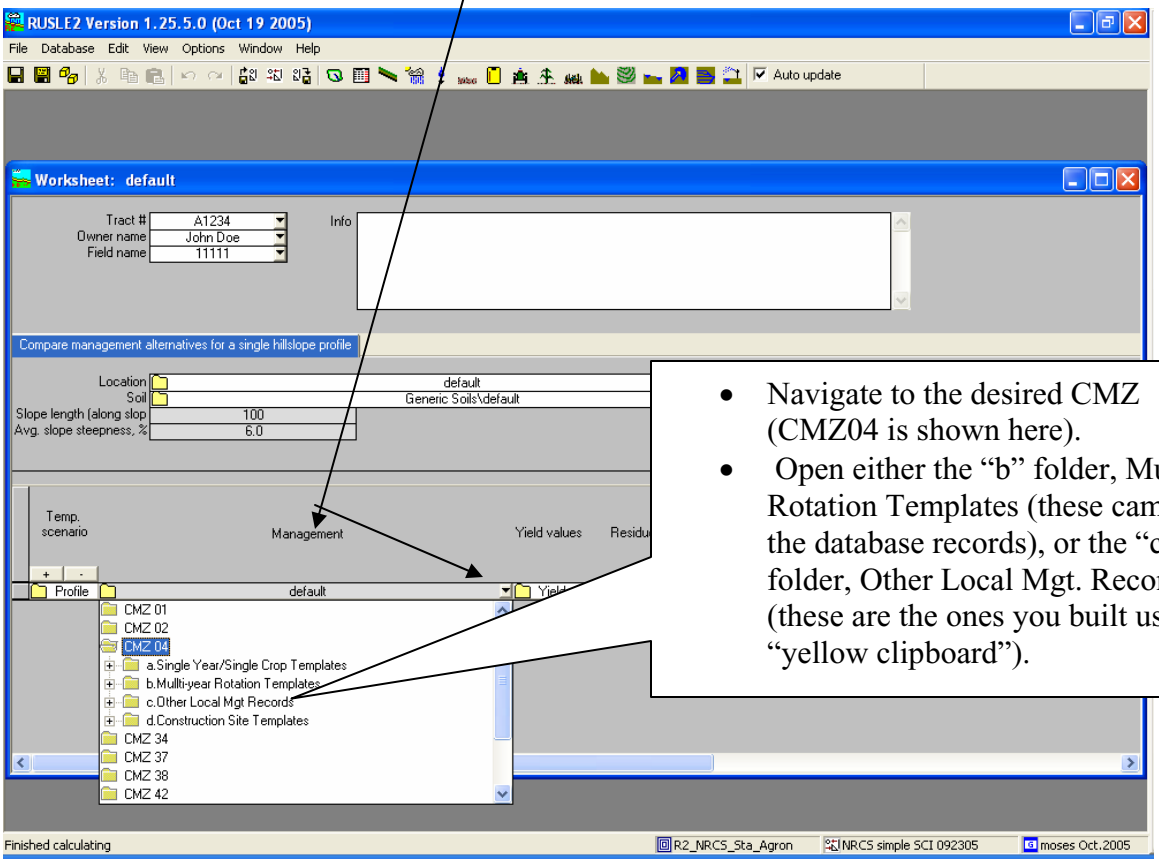
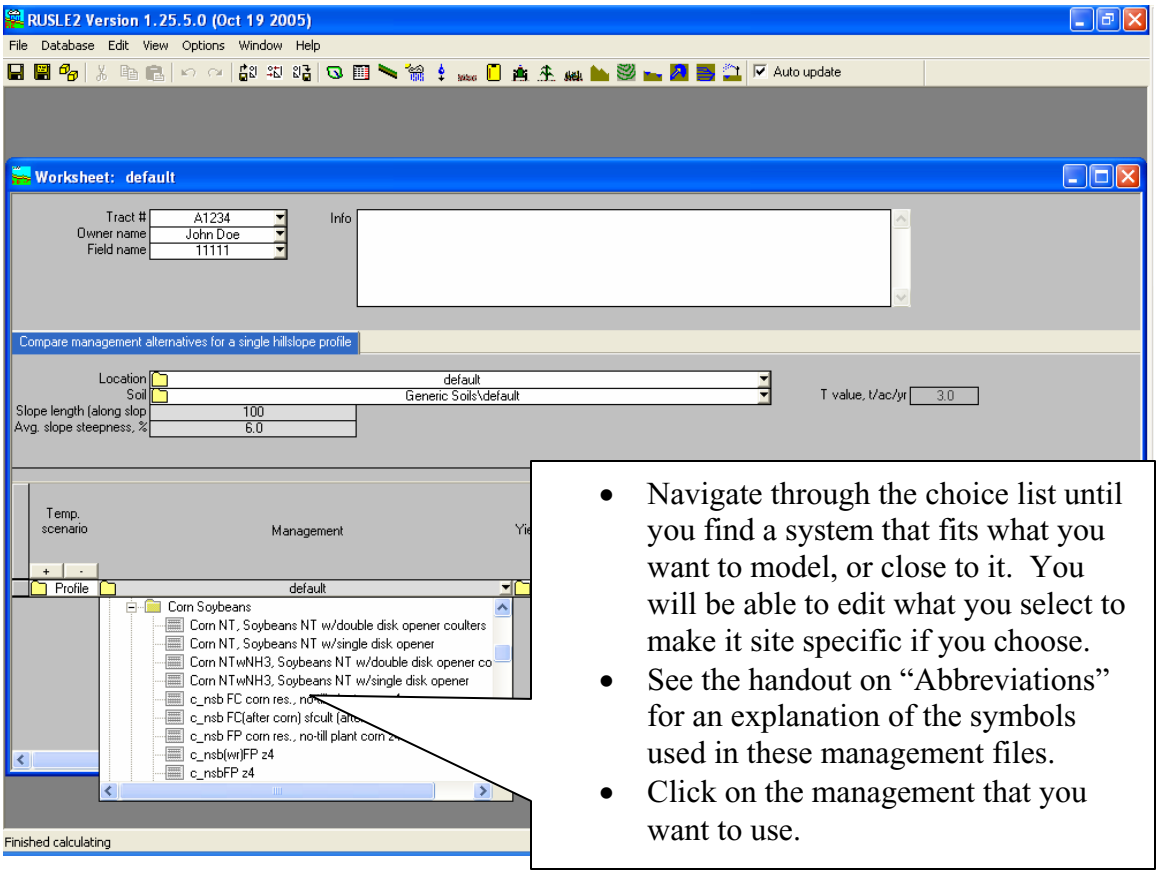
- Select Base Management: This is the step where you will select the management (crop rotation and tillage) from the drop down choice list. This is the same thing that you did in the profile screen. Click on the drop down arrow on the right side of the box under the word “Management”.

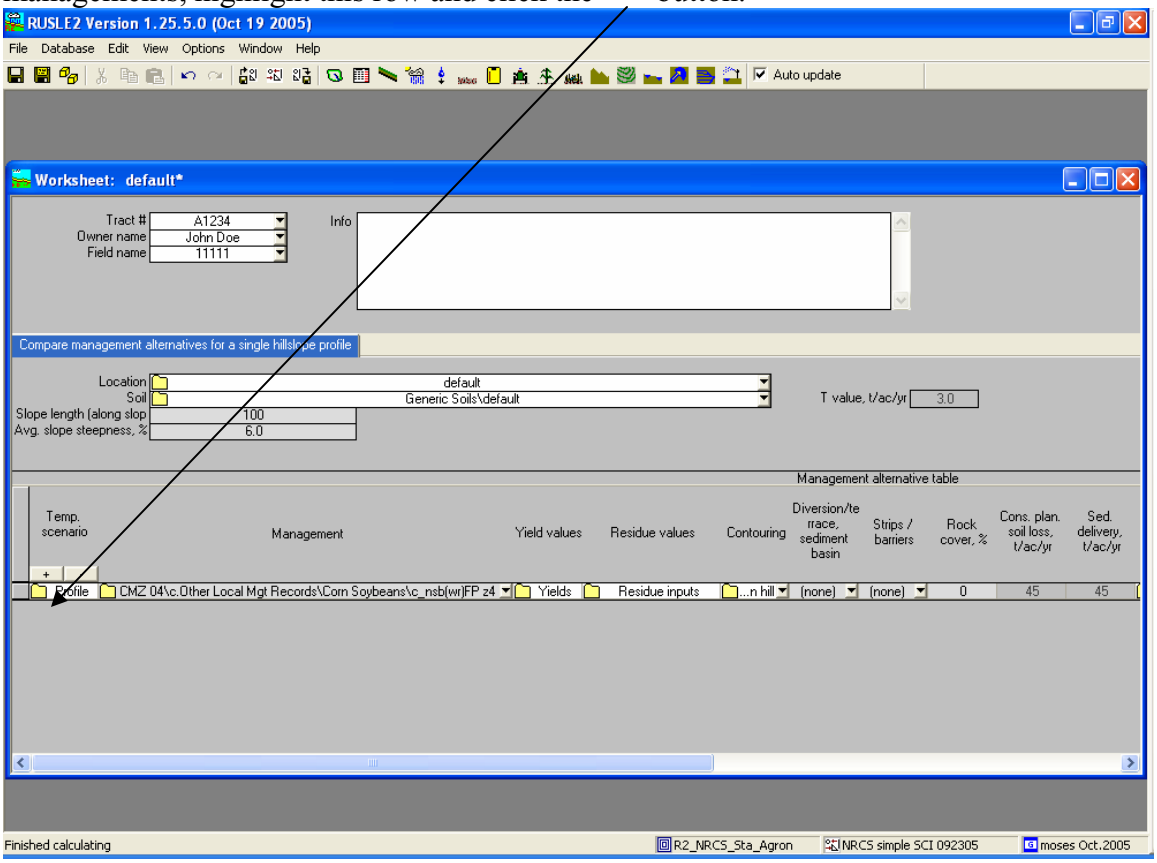


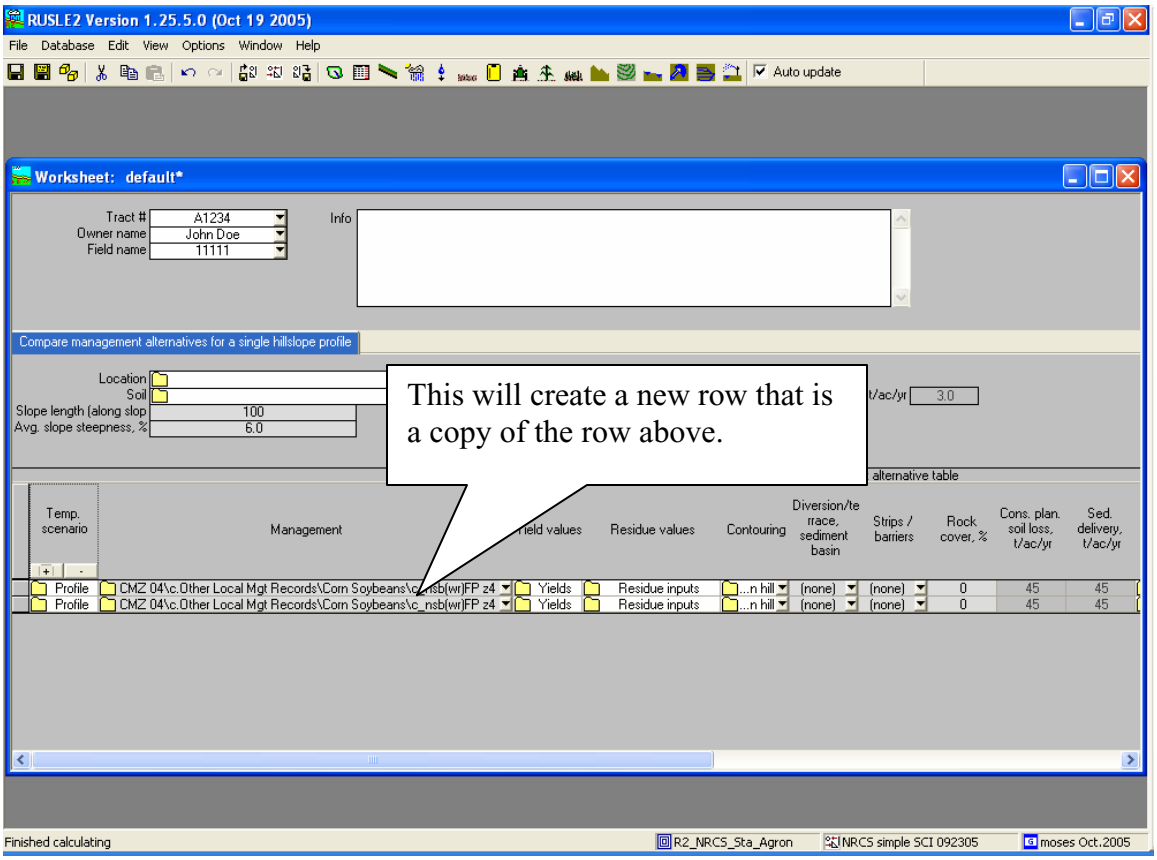
- Navigate to the desired CMZ (CMZ04 is shown here).
- Open either the “b” folder, Multiyear Rotation Templates (these came with the database records), or the “c” folder, Other Local Mgt. Records (these are the ones you built using the “yellow clipboard”).



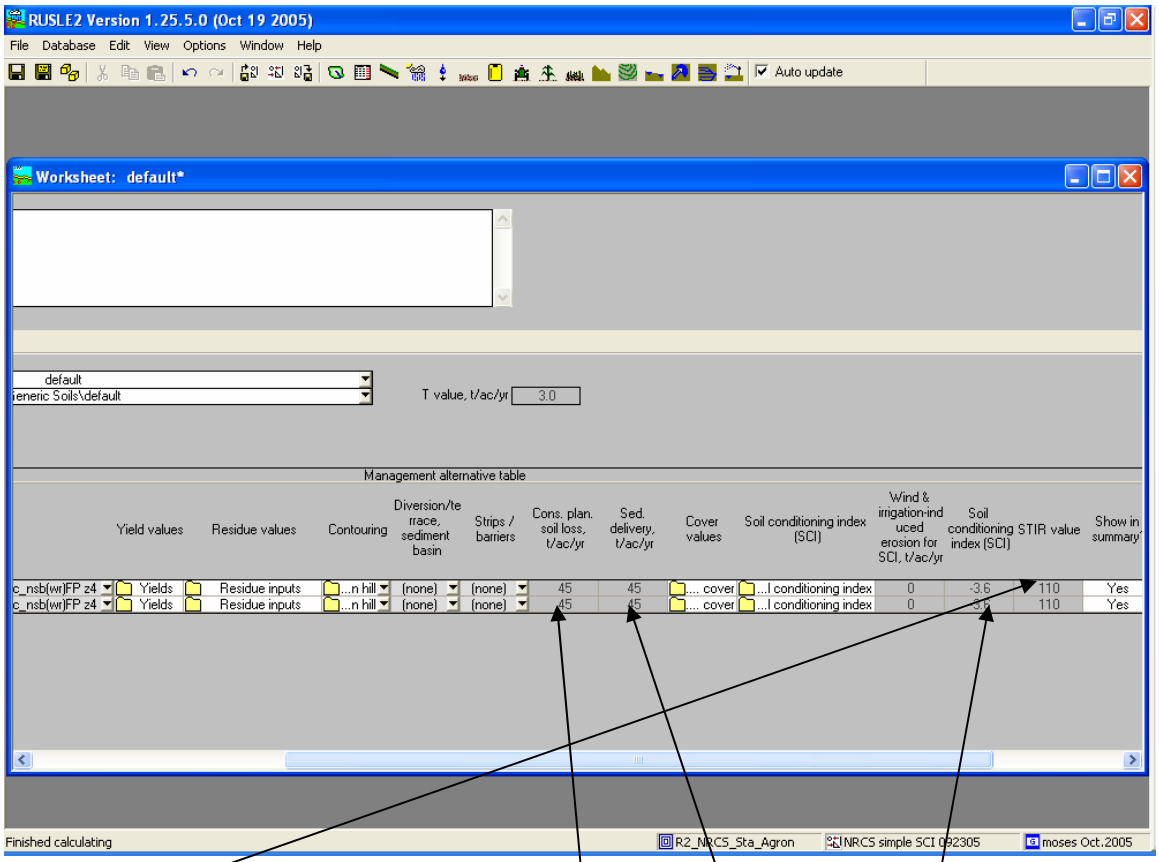
- Navigate through the choice list until you find a system that fits what you want to model, or close to it. You will be able to edit what you select to make it site specific if you choose.
- See the handout on "Abbreviations" for an explanation of the symbols used in these management files.
- Click on the management that you want to use.

You now have your first management selected for your worksheet. To add additional managements, highlight this row and click the "+" button.





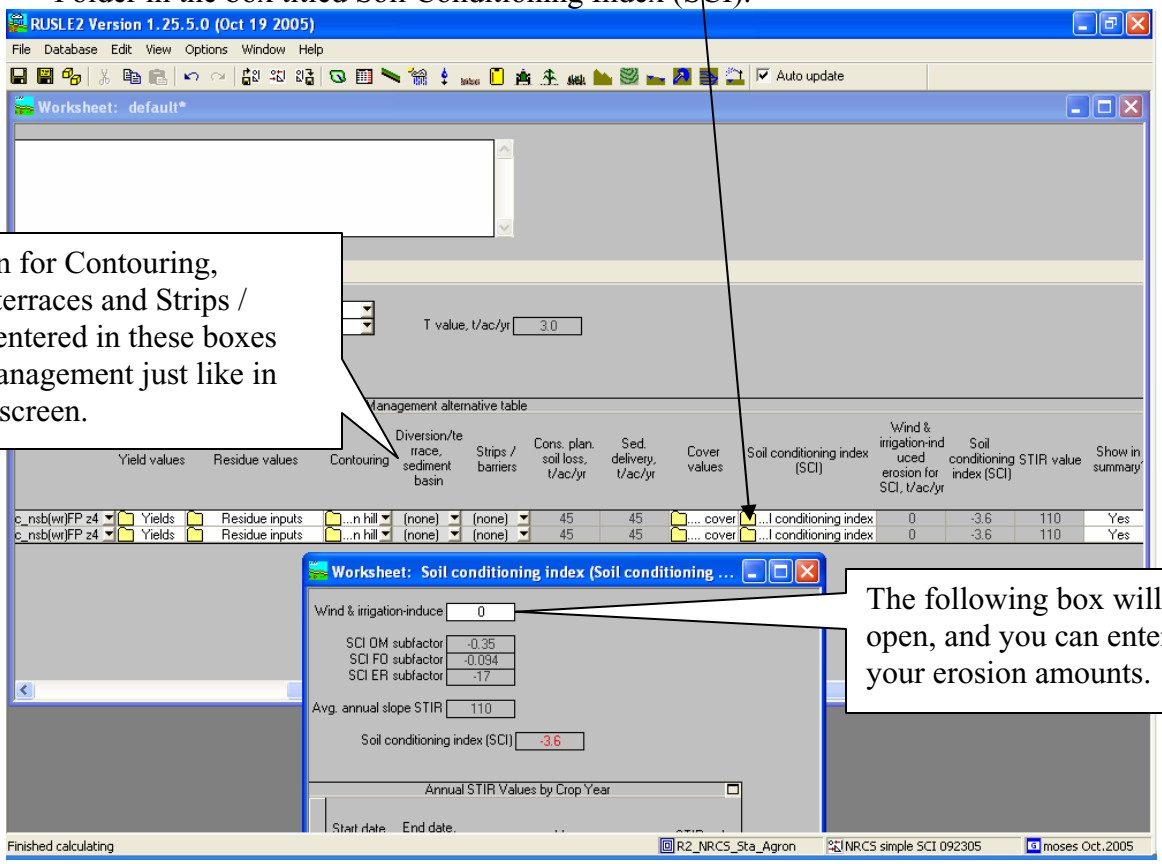
- Follow the same procedure explained above to choose a management for this line.
- Continue with this process to add as many managements as you would like to your worksheet. (Hint: If you have more than about 10 managements on a single worksheet, it will start to take quite a while to load each time you go to use it. If possible, limit the number of managements you list on each individual worksheet to around 10).



- The program will calculate and display the soil loss, sediment delivery, SCI and STIR for each of the managements that you enter.

- Edits can be made to the managements (for example, to change from one kind of tillage equipment to another) in the same way as described under the Profile. Any box with a yellow folder in it is a box where data can be entered or changed. Click on the yellow folder to open that box and enter the appropriate information.

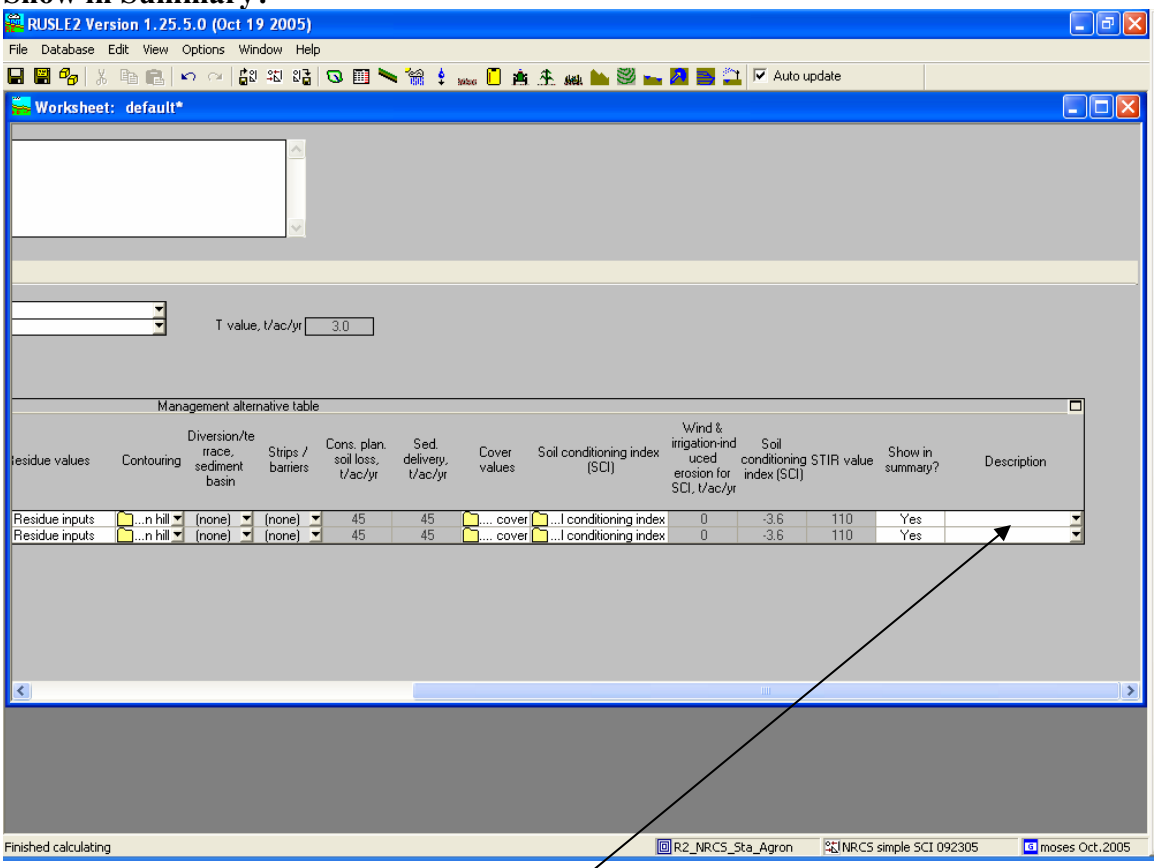
- If you have wind or irrigation-induced erosion that you need to account for, it is entered in the worksheet in the same way as in the profile. Click on the Yellow Folder in the box titled Soil Conditioning Index (SCI).



Information for Contouring, Diversion/terraces and Strips / barriers is entered in these boxes for each management just like in the profile screen.

The following box will open, and you can enter your erosion amounts.

Show in Summary?



- If there is a "yes" in this box, then this row (management) will be shown in the printout, and if this worksheet is used as part of a plan view, this alternative will be shown as associated with this field.
- In the box labeled "Description", enter your description of the important features of this management alternative. This is especially useful when the worksheet will be used in a plan, since this description will be shown there to differentiate between selected alternatives. Clicking on the drop down arrow on the right will expand this box.

Saving

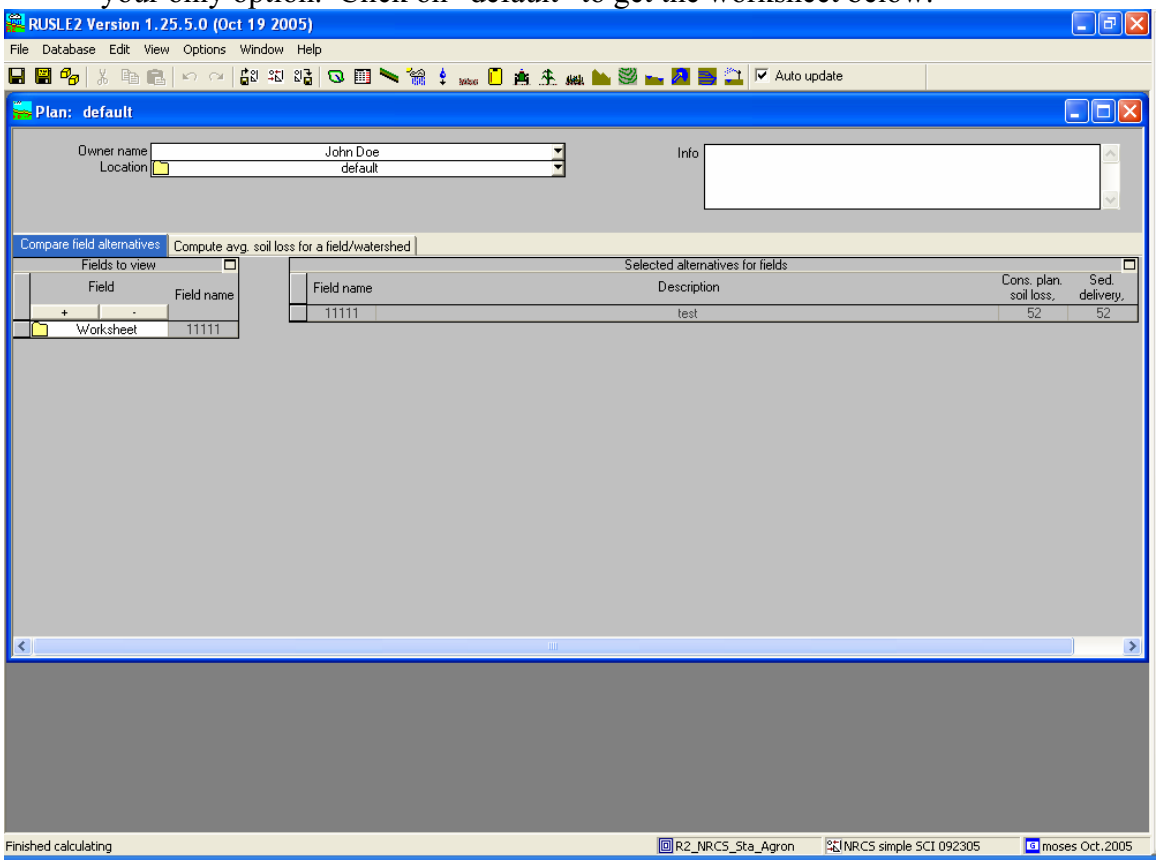
The worksheets you create may be saved in the program for use in the future. Go to the Toolbar, to *File, save as.* Click on this option. You will get a screen that says "Save As". At the bottom of the screen, type in a name for the worksheet and hit "*save*". The worksheet will be saved and available for you to use the next time you open the program.

Printing: Instructions for printing are on page 9 in the "Additions to RUSLE2 Users Guide"

THE PLAN VIEW

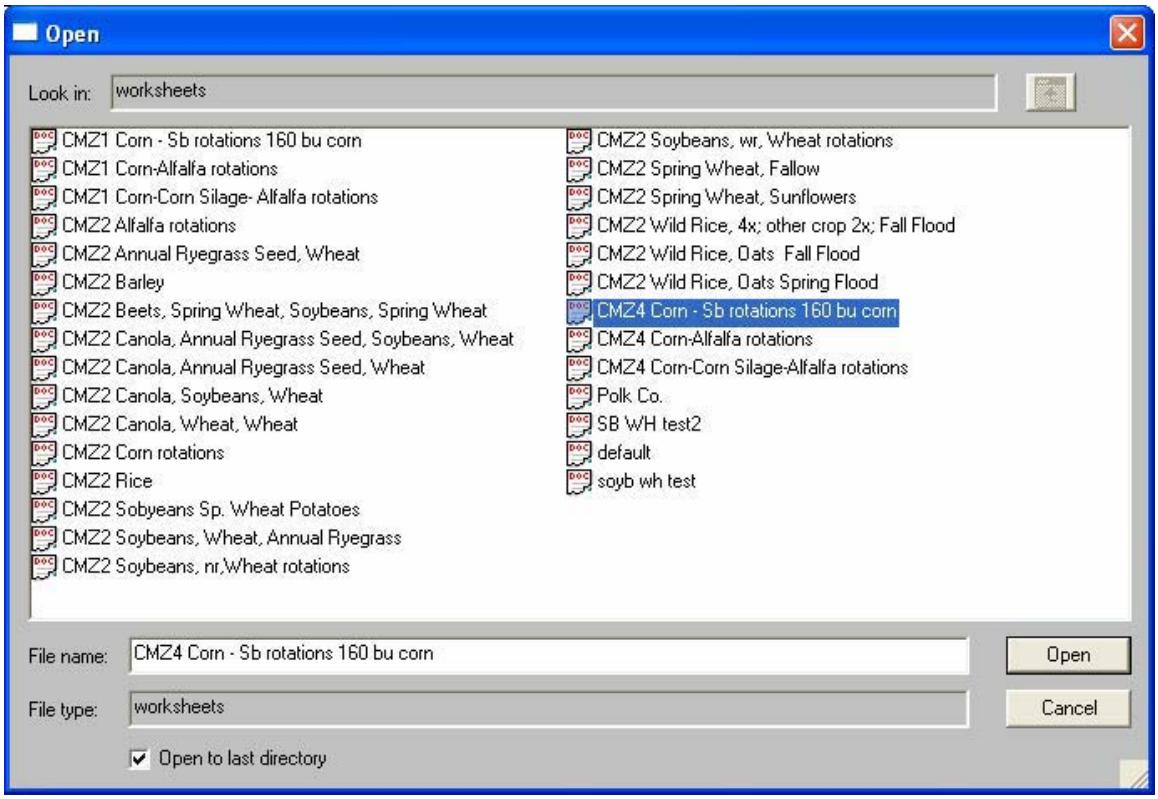
Open the Plan View by clicking on the Green Watershed Icon.

- The first time you open this screen, there will be a "default" choice as your only option. Click on "default" to get the worksheet below.

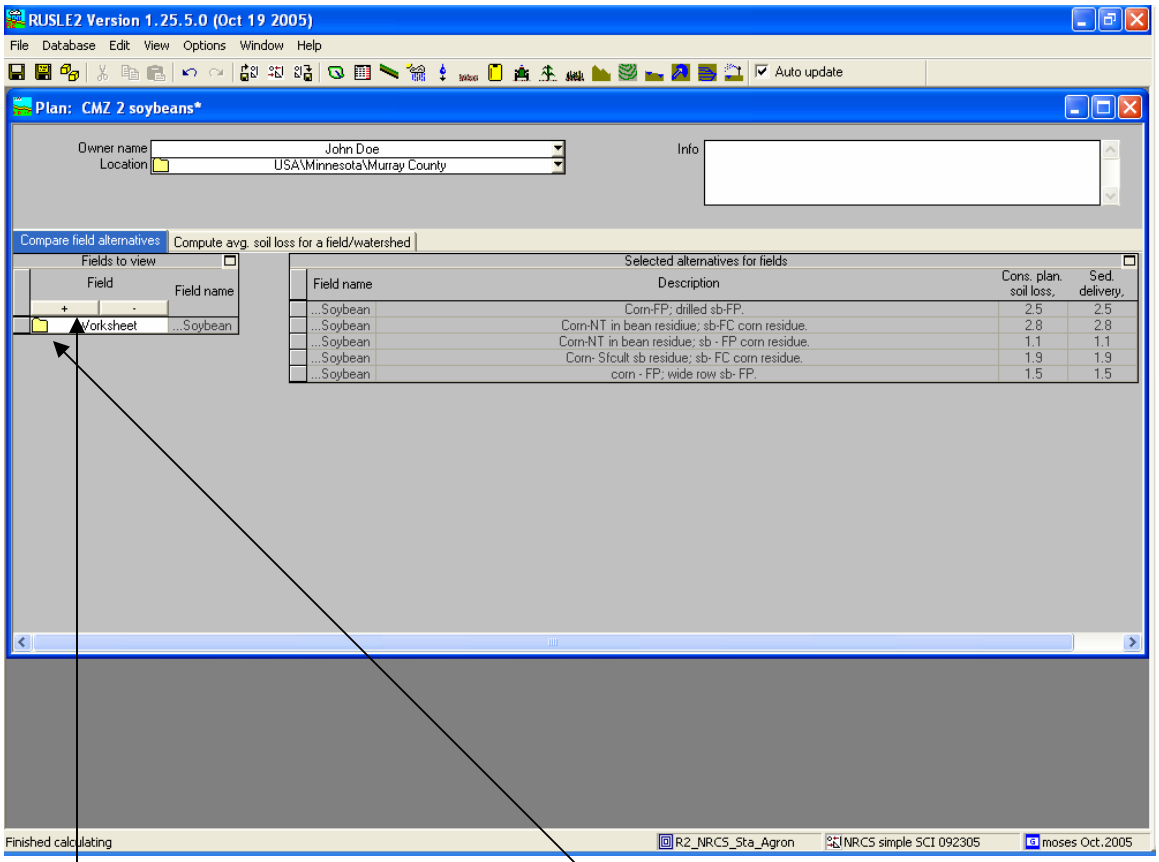


A plan view is used for displaying several fields at once, as you would do in a conservation plan. Enter the owners name, and choose the location from the drop down menu, as you did in the profile and worksheet views.

Highlight t he box that says "Worksheet", and right click on it. You will get a menu box. Choose the option that says "Load from file" and click on it.

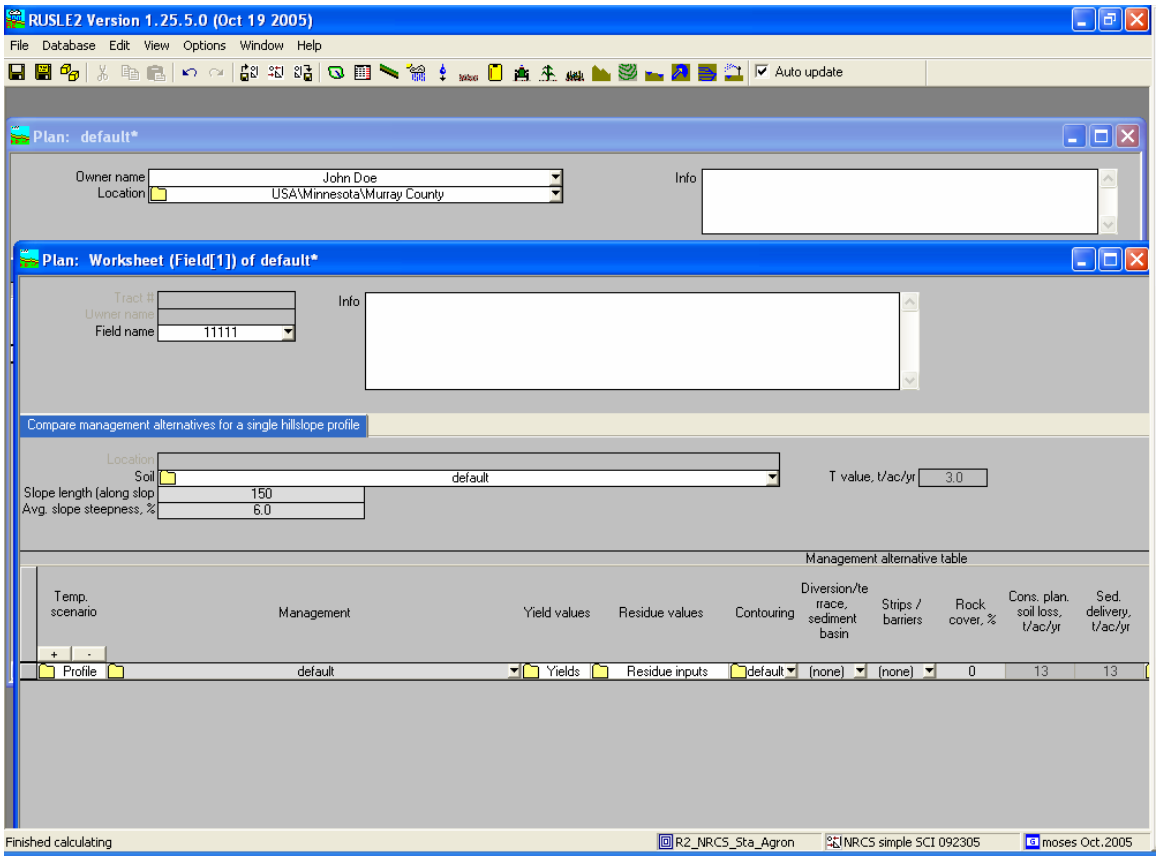


You will get this screen. This is where all of the worksheets you built (using the instructions for the "worksheet view") will be stored. Highlight the worksheet that you want to include in your plan, and click "open".



This screen will be displayed, showing you the alternatives on one field. Click the "+" button above the work "Worksheet" to add another row. Follow the same procedure to choose another worksheet for another field in the plan. The Plan view will show you multiple worksheets of different rotations (which could be on different fields on a farm) on one page.

If you do not have worksheets built and saved, you can create them from this screen as well. If you click on the yellow folder next to the word "Worksheet", it will open the worksheet view (the same view you get by clicking on the Worksheet icon on the toolbar.



You can enter information in this screen following the instructions under "Worksheet View", printed earlier in this document.

Printing and Saving

Printing and saving plans is done the same way as for worksheets and profiles. Go to "*File, Print"* or "*File, Save As*" on the toolbar.